

# THE ORB WEAVER GENUS *NEOSCONA* IN NORTH AMERICA (ARANEAE: ARANEIDAE)

JONATHAN D. BERMAN\* AND HERBERT W. LEVI

## ABSTRACT

The number of North American *Neoscona* species has been reduced to ten. Characters of the male palpus, the epigynum, and the dorsal abdominal pattern have been found useful in species diagnosis. There are keys to the species, and the distributions have been mapped.

Although *Neoscona* species are among the most common spiders in North America and species are found throughout most parts of the world, no thorough study of the group has ever been made. The most important works dealing with the genus are those of F. O. P.-Cambridge (1904), who first recognized several North American species and included detailed descriptions of a number of others, and Archer (1941), who listed many of the North American species but did not give any indication of how he was able to separate them.

Because *Neoscona* includes common spiders, the problem of determining specimens frequently arises in ecological studies. In addition, members of the genus have sometimes been used as laboratory animals. For these reasons it is important that

reliable characters for separating the species be found.

While it is easy to find differences between individual specimens of *Neoscona*, it is far more difficult to find similarities that reflect the common gene pool of species. In this investigation it was found that the most dependable character for separating females of the genus is the epigynum together with the color pattern. Details of the palpus are the best characters for distinguishing males; the macrosetae of the second tibia are not always reliable.

Ten species of North American *Neoscona* were segregated on the basis of these and other characters. Most specimens in collections can readily be placed in one of these species and between the species there are gaps in the characters used. Occasional specimens are difficult to determine, perhaps because poor preservation removed the color pattern, and because of abnormalities or, perhaps, hybridization.

Dr. J. A. L. Cooke made available the collections of both the American Museum of Natural History and Cornell University. Dr. C. D. Dondale, the collections of the Canadian National Museum. Other Canadian collections were supplied by D. J. Buckle. Dr. H. K. Wallace loaned large collections from Michigan and Florida with ecological data, and Dr. W. Shear provided specimens and other help. Dr. H. V. Weems sent specimens from the Florida State Museum. Dr. M. Grasshoff loaned

---

\* This study was started as a senior thesis for Harvard College by J. D. B. The object was to find characters that can be used in separating species of the genus. The characters carefully studied were coloration and pattern, size, epigynum, and spination of the second tibia of males. The palpi of the species separated by these criteria were later studied in detail by H. W. L. and nomenclatural problems resolved.

specimens from the Senckenbergischen Naturforschenden Gesellschaft. Dr. J. G. Sheals and Mr. D. J. Clark made it possible for H. W. L. to examine the many types at the British Museum (Natural History). Dr. J. Prószyński of the Polish Academy of Sciences made the Taczanowski collection available to us, Prof. M. Vachon and Mr. M. Hubert of the Muséum National d'Histoire Naturelle, Paris, loaned many specimens. Specimens from the University of Costa Rica were made available by Dr. D. C. Robinson and Mr. C. E. Valerio. Mr. D. Bixler and Dr. R. E. Leech loaned specimens from personal collections. Dr. H. T. Boschung of the University of Alabama, Museum of Natural History, made Archer specimens available. Laurie Gutman helped with the draft of the thesis first prepared by J. D. B., Lorna R. Levi edited the final manuscript. Dr. Peter van Helsing was most helpful in discussions about the unusual nomenclatural complications. This investigation was supported by Public Health Service Research Grant AI-01944, from the National Institute of Allergy and Infectious Diseases.

## INTRODUCTION

Although observations were restricted primarily to spiders collected from North America (including Central America), the West Indies and Hawaii, some study of Old World *Neoscona* was undertaken in order to assess similarities and differences between Old and New World forms.

*Selection of characters.* The choice of characters to be studied was guided primarily by trial and error, as well as some knowledge of what characters are useful in the classification of other groups of spiders. Although the reasons for it are not well understood (Mayr, 1963), the structure of the genitalia of both sexes is often a highly specific character in spiders, as well as in a number of other arthropods. The initial observations were therefore made on the epigynum of the female and

the palpus of the male. On the inspiration of Kaston (1948), who distinguished between male *Neoscona* from Connecticut on the basis of the macrosetae of the second tibia, comparisons of the arrangements and patterns of macrosetae on that leg segment were made.

During the course of the study, large and often striking variations in the dorsal coloration of the abdomen were noted, and so systematic observations on this character were made, as well as comparisons of ventral abdominal patterns. The specific carapace coloration of some spiders and the presence of a coniform spur on coxa IV of certain others were noted as incidental observations.

The measurements are not expected to be useful in separating species, but were taken to provide supplementary data on species separated by other means. Since the abdomen size is particularly variable, depending on how well-fed the spider was at the moment of collection, the carapace measurements are undoubtedly more useful in comparing species. Measurements of less than 10 mm are probably accurate to within 0.2 mm.

*Epigynum.* Differences in the structure of the epigynum proved to be the best basis for separating females. In *Neoscona* the epigynum may have one or two pairs of lateral bulges or none at all. These bulges may be positioned either flush with the ventral surface of the scape, somewhat dorsal to it, or with either the proximally or distally situated end of each bulge connecting with the ventral margin and the opposite end extending dorsal to it. In the latter two cases, in ventral view, part of each bulge projects beyond the margin and part can usually be seen beneath the surface of the scape, as the epigynum in *Neoscona* tends to be somewhat transparent. The number of pairs of bulges and their position, both proximal-distal and dorsal-ventral, on the scape appears to be highly specific. Occasionally the bulges were obscured, however, especially in

specimens (presumably collected late in their lives) that had unusually heavily sclerotized epigyna. This tendency is particularly pronounced in *N. oaxacensis*.

The presence or absence of a contraction near the midpoint of the scape is apparently constant for a species and is sometimes useful (especially when absent, as most species have it). The contraction seems to be variable in *N. oaxacensis*.

It is possible that small epigynal differences such as occur between *N. arabesca* and the much larger *N. domiciliorum* may be more functions of the size of the spider than good specific differences, and therefore the epigynum of an unusually large *N. arabesca* might resemble that of a very small specimen of *N. domiciliorum*.

*Palpus.* The palpi in male *Neoscona* are apparently very similar in all species. Some differences were noted in the shape and position of the paracymbium and median apophysis and in the location of the terminal spine on the median apophysis, but these differences were not consistent and did not appear to be usefully specific. Not until near the end of the study were palpal characters found more usable than the macrosetae of the second tibia: the shape and attachment of the terminal apophysis, the shape of the embolus with its lamella, the shape of the conductor and the places where the unusual fused bulb is broken and the parts are slightly movable against each other.

*Macrosetae of second tibia.* The arrangement of macrosetae on the second tibia, sometimes in conjunction with other characters, provided a useful criterion for separating males. In *Neosecona* there may be one, two, or three rows of clasping macrosetae along the prolateral surface of this leg segment. Although the total number of macrosetae varies considerably within a species, their gross pattern, including the number of rows (maximum number of macrosetae abreast), appears to be quite fixed. In addition to the clasping macrosetae, the second tibia usually

possesses one prominent ventral macroseta at the proximal end and two or three large dorsal spines. Some *Neoscona arabesca* and *N. nautica* can easily be recognized by striking and characteristic deviations from this pattern. Also, the tibia itself may be curved, with the prolateral surface concave, but this curvature is quite variable and not especially reliable in most cases.

Although Beatty (1970) reports that injuries during the course of development may produce sizeable variations in the leg macrosetae of *Ariadna*, it is not likely that such an occurrence would produce a sizeable change in the overall pattern in *Neoscona*, especially as the clasping macrosetae do not appear until the final molt. Another possible hazard in using the tibial macrosetae to separate the species is that the number of rows may vary with the size of the specimen. However, in southern specimens of *Neoscona arabesca*, which vary considerably in size (total length of the male: 3.9–9.2 mm) and were at first separated primarily by the presence of a large number of ventral tibial macrosetae, it was noted that the number of rows of clasping macrosetae remains fixed, although the number and size of the macrosetae increases somewhat with the increasing body size. As the macrosetae at the proximal end of prolateral surfaces are often longer and more variable than the stout, relatively uniform macrosetae of the distal half, in some species it is uncertain whether just the distal or all the prolateral setae should be referred to as clasping macrosetae. We have tried to make clear, in the descriptions of individual species, exactly which macrosetae are considered clasping in each case.

*Dorsal abdominal pattern.* When one gains familiarity with spiders of this group, it becomes possible to recognize most individuals of most species solely on the basis of the dorsal coloration of the abdomen (Plates 1, 2, 3). In some cases this coloration can be a reliable specific char-



Plate 1. Top Fig. *Neoscona pratensis*, juvenile from Florida. Bottom Fig. *Neoscona arabesca*, female from Massachusetts.

acter, while in others there is too much variation or the pattern may be faded too often to be of use. A major cause of variability in the dorsal pattern is the content of the abdomen, which may show



Plate 2. *Neoscona domiciliorum*, female from Florida.

through the cuticle. In species in which bright colors, presumably because of pigment in the cuticle, make up the pattern, observed differences are usually reliable. As males are generally lighter colored than females, they are usually more variable and more difficult to separate on the basis of this character.

A possible cause of error in separating *Neoscona* by coloration is variation resulting from uneven preservation. If the alcohol has been changed often, more pigment may be removed than if there are long delays between changes, and significant differences in the coloration of specimens may result.

*Ventral abdominal pattern.* Characteristically, the ventral pattern consists of an area of black bordered by white, roughly forming a square with the epigastric furrow as the anterior edge (Plate 3). The differences observed are too inconsistent for use in separating species. Furthermore, in adults the pattern is often faded and indistinct, although in juveniles it tends to be clear.



Plate 3. *Neoscona domicillorum*. Top Fig. female from Washington, D. C. Bottom Fig. female from Florida.

*Carapace*. Distinct carapace coloration was observed in females of three species. In two (*Neoscona hentzii* and *N. nautica*) it is probably too variable to be of much use, but in *N. orizabensis* it is highly characteristic (Fig. 7) and will separate the female of that species.

*The fourth coxa*. Males of several species can easily be separated by the presence of a coniform spur on the posterior edge of the ventral surface of coxa IV (Fig. 9).

After lengthy testing, dependable characters have been found that provide clear gaps between the populations (Michener, 1970), and these populations are presumed to be the species.

### *Neoscona* Simon

*Neoscona* Simon, 1864, Histoire Naturelle des Araignées, ed. 1: 261. Type species: *N.*

*arabesca* Walckenaer, designated by F. O. P.-Cambridge, 1904, Biologia Centrali-Americana, Araneidea, 2: 466.

*Chinestela* Chamberlin, 1924, Proc. U. S. Natl. Mus. 63: 20. Type species by monotypy *C. gisti* Chamberlin, 1924, 63: 20, pl. 5, fig. 37, ♂. Male holotype without palpi from Soochow, China, in the U. S. National Museum, examined. One palpus marked holotype in the Museum of Comparative Zoology, examined (which has since been presented to the U. S. National Museum). The other palpus is presumably in the Univ. Utah collection.

*Cubanella* Franganillo, 1926, Cuba Contemporare, 41 (161): 14. Type species by monotypy *C. nidicola* Franganilla [= *Neoscona neotheis*].

*Eriovixia* Archer, 1951, Amer. Mus. Novitates, 1487: 34. Type species by original designation *Eriovixia rhimurus* (Pocock) [= *Araucius rhimurus*]. NEW SYNONYMY.

*Neosconopsis* Archer, 1951, Natur. Hist. Misc., Chicago Acad. Sci., 84: 3. New subgenus. Type species by monotypy and original designation *Neoscona adianta* (Walckenaer) [= *Araucius adiantus*]. NEW SYNONYMY.

*Note*. *Chinestela gisti* is very close to *Neoscona hentzii* in appearance. *Cubanella* was first synonymised by Franganillo himself. *Eriovixia* is considered a synonym because the female genitalia are like those of *Neoscona* species. The scape differs slightly in being flatter. Also the abdomen has a "tail." There is no reason to keep this name for a separate genus, unless the unknown male proves to have characters distinct from *Neoscona*. *Neosconopsis*, according to Archer, differs from *Neoscona* in that "the stalk on which the main piece of the median apophysis of the male palpus is situated is wide instead of pedunculate." As far as we could tell, the median apophysis attachment is like that of all other carefully examined species and Archer's observation is erroneous.

The name *Neoscona* is of feminine gender.

*Description*. In all species the anterior median eyes are largest or subequal to posterior medians; the secondary eyes are just slightly smaller. The posterior lateral eyes may be the smallest. The anterior median eyes are usually slightly more than

their diameter apart, the posterior medians slightly less than their diameter. The height of the clypeus is slightly less than the diameter of an anterior median eye. The carapace has a longitudinal thoracic groove, which in males may be extended by a line stretched over most of the carapace. It is less distinct in females (Fig. 7), and is hidden in living specimens by setae (Plates 1-3). The first legs are longest, the second, second in length, the third shortest. All males have a hook on the distal rim of the venter on the first coxa and have macrosetae on the prolateral surface of the second tibia. The abdomen varies in shape: oval in *Neoscona arabesca*, elongate in *N. oaxacensis*, triangular in *N. nautica*, and with humps in *N. redempta*. In all, the venter of the abdomen is black bordered on the sides by white spots (Figs. 10-13).

Males are only slightly smaller than females.

*Diagnosis.* The longitudinal thoracic groove on the carapace separates all members from *Aranus*. Together with the fused epigynum and unique palpus (see below) the species are readily separated from related *Aranus*. All species have a black patch between epigastric furrow and spinnerets, bordered by one or two white spots on the sides.

*Genitalia.* Both male and female genitalia have structures fused, probably secondarily. The epigynum is a simple tongue, the scape completely fused to the base. The openings are underneath (dorsal surface), an indication that most of the structure may be derived from the base

which in *Aranus* has the openings (Figs. 14-25).

The palpus is unique in several ways. It seems never to have been described before. The cymbium covers the face of the bulb (Figs. 1, 4), and has expanded in such a way that most structures are hidden by it (Y in Fig. 4). In *Aranus* the cymbium is a more or less narrow strip. The radix (R), stipes (I), and embolus (E) have fused almost immovably in *N. arabesca* (Fig. 5). In *N. oaxacensis* (Fig. 4) and in *N. nautica* (Fig. 116) a small hematodocha separates two sclerites, probably the stipes and radix. The hematodocha is reduced compared to that of *Aranus* species. The embolus (E) is more or less drawn out, tube-shaped to conical, to the side of which the embolus lamella (L) is attached. The embolus rests against the conductor (C) and is covered apically by the terminal apophysis (A). The terminal apophysis is a thin flap in most species; it is much reduced in *N. nautica* (Figs. 118, 119). The conductor is in all a thumb-shaped projecting structure, sclerotized, the side of its tip light in color and facing the embolus. The base of the conductor varies in shape. The greatest difference between species is in the shape of the embolus with its lamella, the terminal apophysis (seen in apical view), and also the conductor. Unfortunately, this embolus is completely surrounded by conductor, terminal apophysis, and also the cymbium. In *Neoscona neotheis* the stipes-radix joint is sclerotized, facilitating its recognition.

In this study the cymbium was removed

Figs. 1-6. The left palpus of *Neoscona*. 1-3, 5-6. *N. arabesca*. 4. *N. oaxacensis*. 1. Ventral view. 2. Lateral view. 3. Dorsolateral view. 4. Ventral view with cymbium cleared. 5. Expanded, bulb subventral view. 6. Expanded, bulb dorsal view.

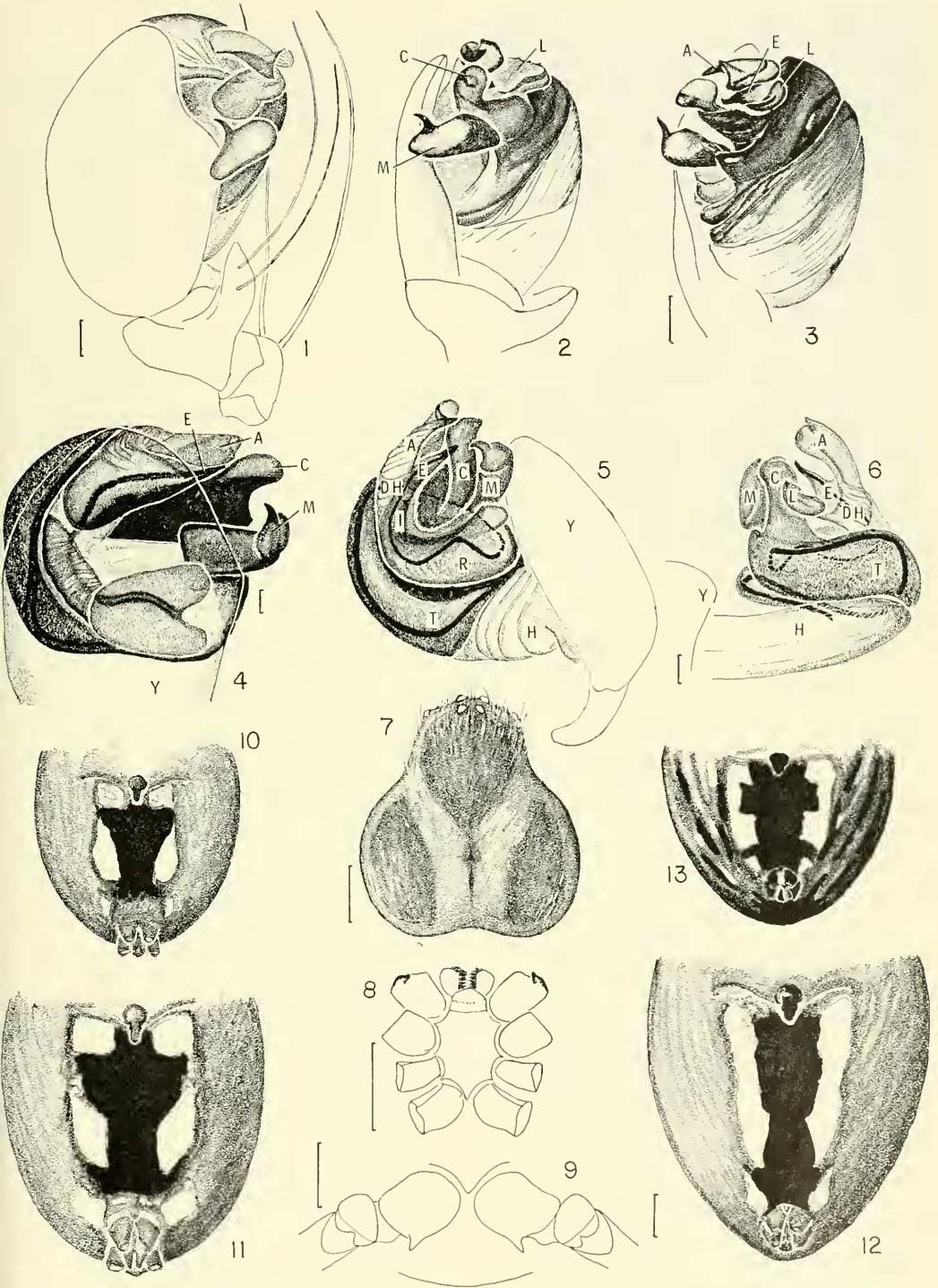
Fig. 7. *Neoscona orizabensis* F. P.-Cambridge, female carapace.

Fig. 8. *Neoscona arabesca* (Walckenaer), venter of male cephalothorax with legs beyond coxae removed.

Fig. 9. *Neoscona oaxacensis* (Keyserling), fourth male coxa and trochanter.

Figs. 10-13. Female abdomen, ventral view. 10. *N. arabesca*. 11. *N. oaxacensis*. 12. *N. neotheis*. 13. *N. nautica*. Scales. Palpi, 0.1 mm; others, 1 mm.

Abbreviations. A, terminal apophysis; C, conductor; DH, distal hematodocha; E, embolus; H, basal hematodocha; I, stipes; L, lamella of embolus; M, median apophysis; R, radix; T, tegulum; Y, cymbium.



from at least one specimen of each species to facilitate drawing. However, for routine examination this is not necessary.

The terminal apophysis is of characteristic shape and one can readily separate *Neoscona arabesca* from related species by looking at it (in apical view, ventral view of the spider with the palpus flexed). It was the decisive factor in synonymizing *N. minima* and *N. arabesca*. For the purpose of making the diagrammatic drawings (Figs. 26, 27), an outline drawing was first made, then the structure torn off. The terminal apophysis is opaque at its base, transparent at its distal margin. The individually variable transparent area may at first be confusing to those wanting to use the structure for determining species. The terminal apophysis does not have to be removed for making determinations. In *N. nautica* the terminal apophysis is minute.

The median apophysis, at first studied carefully, seems to be of little use in separating species. Its general appearance is as in *Araneus diadematus* relatives. The detailed shape of the conductor may be useful: Its large head and S-shaped appearance seem to separate *N. hentzii* from other species. The conductor is best studied in lateral view.

The palpal tibia has two setae, one of which may be longer than the other.

When naturally expanded, the bulb is propelled away from the enclosing cymbium. The various sclerites of the bulb hardly shift in position. Males in collections rarely have the palpi expanded.

*Natural history.* *Neoscona* species are among the most common and abundant orb weavers. *Neoscona arabesca* can be obtained in large numbers by sweeping meadows or fields in summer or late summer (in southern Canada and the northern states). I found the European *Neoscona adianta* (Walckenaer) just as common in southern Europe, collecting it in every

meadow and field visited in southern Italy and Dalmatia.

In New England and Wisconsin there is only one generation a year (of both *Neoscona arabesca* and *Neoscona hentzii*), males maturing in late June and July, females in July and August. Collections of *N. oaxacensis* suggest that it also has only one generation a year, most adults having been collected between August and November.

In shape, the egg case varies from a flattened sphere to a lens-shape (of *N. arabesca* and *N. hentzii*), and is covered by some loose silk. Kaston (1948) described that of *N. arabesca* as being about 10 mm in diameter and containing 280 yellow eggs agglutinated in a mass measuring  $9.0 \times 5.4 \times 3.6$  mm. *Neoscona hentzii* egg cases (according to Kaston, 1948) are made of fluffy yellow threads in a rolled up leaf. One had a large diameter of 12 mm, another one, spherical, had a diameter of 5 mm. The first had 1000 eggs, the second 867. The eggs were oval, measuring  $0.97 \times 1.15$  mm.

We assume that because of its great abundance, every spiderling having a web, *Neoscona* may be of importance in controlling insect numbers.

*Web.* The webs of *N. arabesca* and *N. hentzii* are vertical. Kaston (1948) describes the *Neoscona arabesca* web as having about 20 radii and being 15–45 cm in diameter. One with 18–20 radii is illustrated in Comstock (1940, figs. 530, 531). The hub is open, crossed by only one or two threads, unlike webs made by species of *Araneus*. There are relatively few threads toward the retreat. According to Comstock, *N. arabesca* rests in the center of the web with the tip of the abdomen pushed through the open space. All our observations (and apparently those of Kaston) agree that during daytime *N. arabesca* stays in a retreat to the side of the web, usually in a curled up leaf. The web of *N. oaxacensis* is illustrated in Plate 4.



*Distribution.* Species of *Neoscona* are found on all continents. Unfortunately, many have always been placed in *Araneus*. The common species found in Europe is *Neoscona adianta* (Walckenaer), the genitalia of which are much closer to those of North American species than to the cosmopolitan *N. nautica*. *Neoscona nautica* may be native to the Pacific area, judging by the similar species in this area. Other European species belonging to *Neoscona* are *Epeira crucifera* Lucas, 1839 and *E. byzanthina* Pavesi, 1876, both of the Mediterranean region.

*Species groups.* *Neoscona nautica*, presumably introduced, is the most distinct species occurring in North America. It is the only species in which the male palpus has a minute curved terminal apophysis; the terminal apophysis of all other species is a flap. Also, the females of *N. nautica* have a short triangular epigynum, shorter than that of other species.

The three species *N. oaxacensis*, *N. neotheis* and *N. pratensis* are very similar. The pattern characteristic of each of the first two may be similar. The males of all three have a spur on the fourth coxa. Their distribution is allopatric: *N. oaxacensis* is found from California and Texas to South America, *N. neotheis* is West Indian, *N. pratensis* is found in the United States, outside the range of *N. oaxacensis*.

Of the remaining North American species, *Neoscona hentzii* (east of the Rocky Mountains to Arizona) is the largest and most distinct, having a scape with a spoon-shaped end following a constriction (Figs. 51–53). The male has an S-shaped, short conductor (Fig. 55). The genitalia of *N. arabesca* (from Canada to Central America), *N. domiciliorum* (eastern United States), *N. utahana* (south-central states) and *N. orizabensis* are much alike. However, *N. arabesca* is smaller than the species sympatric with it and all four have distinct dorsal abdominal patterns. Most illustrations were drawn to the same scale.

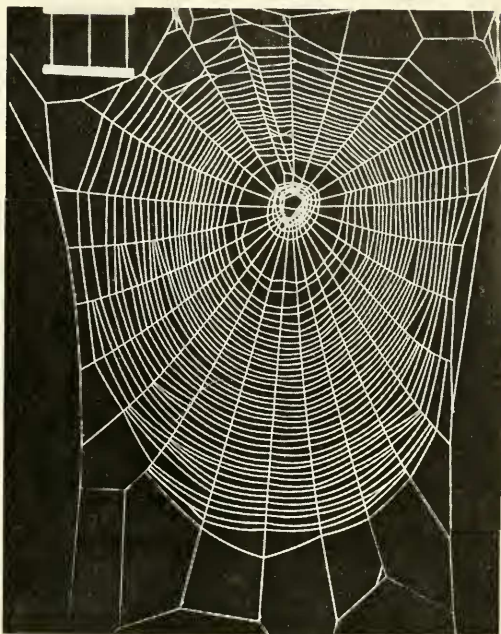


Plate 4. Web of *Neoscona oaxacensis* made in the laboratory. Space between two rods on top is 20 mm, photographed on high contrast film. (Courtesy Peter N. Witt)

Asiatic species were examined and many were found similar to the North American *Neoscona*, but they are believed distinct.

*Misplaced species.* *Neoscona granadensis* (Keyserling) = *Araneus granadensis* (Keyserling). The type of this species appears to be lost.

#### Key to *Neoscona* females

- 1a. Abdomen with distinct humps and a lateral wavy line (Fig. 124), Texas ..... *redempta*
- 1b. Abdomen without humps and not having a wavy line on each side ..... 2
- 2a. Epigynum with scape very broad and triangular (Figs. 111–115); dorsal abdominal pattern indistinct, dark olive to brown (Fig. 120) ..... *nautica*
- 2b. Epigynum not as above ..... 3
- 3a. Dorsal abdominal pattern of longitudinal bands as Fig. 100 or Fig. 110 ..... 4
- 3b. Dorsal abdominal pattern otherwise ..... 5
- 4a. A median dark band bordered by a light line on each side (Fig. 110); epigynum without lateral bulges at midpoint (Fig. 101) ..... *pratensis*

- 4b. A median white band bordered by two black, longitudinal bands (Fig. 100); scape with lateral bulges near midpoint (Fig. 91); West Indies ..... *ucothisis*
- 5a. Abdomen subtriangular with a dorsal folium sharply delimited on sides (Fig. 77); south-central states to northern Mexico ..... *utahana*
- 5b. Abdomen oval or if subtriangular, marked otherwise ..... 6
- 6a. Epigynum without lateral bulges (Figs. 14-25); abdomen suboval with dorsal posterior black marks at an angle (Figs. 34, 35); total length (north of Mexico) usually less than 8.2 mm, carapace less than 2.8 mm long ..... *arabesca*
- 6b. Epigynum with more or less distinct lateral bulges (Figs. 43, 59, 78); abdomen triangular, if suboval marked otherwise; total length (north of Mexico) usually more than 8.5 mm, carapace more than 3.7 mm long ..... 7
- 7a. Abdomen oval to elongate with median light band made up of spots (Figs. 88-90); epigynum with one pair of bulges (Figs. 78, 81-83); California, Utah, Texas to Peru ..... *oaxaccensis*
- 7b. Abdomen triangular or oval and marked otherwise; epigynum with one or two pairs of bulges ..... 8
- 8a. Carapace chestnut brown with light brown longitudinal bands (Fig. 7), central Mexico ..... *orizabensis*
- 8b. Carapace otherwise or, if similar, not found in central Mexico ..... 9
- 9a. Epigynum with one pair of bulges (Fig. 43), abdomen contrastingly marked (Fig. 50), eastern U. S. .... *domiciliorum*
- 9b. Epigynum with two pairs of bulges, the proximal indistinct (Fig. 51), abdomen without contrasting markings (Fig. 58); east of Rocky Mountains, Arizona ..... *hentzii*

**Key to *Neoscona* males**

- 1a. Coxa IV with a spur (Fig. 9) ..... 2
- 1b. Coxa IV without a spur ..... 4
- 2a. Abdomen with a median dark band bordered by a white line (Fig. 110); bulb of palpus not sclerotized near attachment of terminal apophysis (Figs. 106, 108), Canada, United States ..... *pratensis*
- 2b. Abdomen colored otherwise, palpus sometimes having this sclerotization ..... 3
- 3a. Abdomen with a median light band with straight margins bordered by black bands (Fig. 100); bulb of palpus sclerotized near attachment of terminal apophysis (Figs. 96, 98), West Indies ..... *ucothisis*

- 3b. Abdomen otherwise; bulb of palpus not sclerotized near attachment of terminal apophysis (Figs. 84, 86); California, Utah, Texas to Peru ..... *oaxaccensis*
- 4a. Terminal apophysis a minute curved structure (Figs. 118, 119) ..... *nautica*
- 4b. Terminal apophysis a flat flap (Figs. 3, 4, 6) ..... 15
- 5a. Abdomen with a dorsal folium distinctly set off on its sides (Fig. 77); south-central states ..... *utahana*
- 5b. Abdomen without such a folium ..... 16
- 6a. Terminal apophysis with sides more or less parallel and a wide notch on distal end (Figs. 26, 27) ..... *arabesca*
- 6b. Terminal apophysis of different shape ..... 7
- 7a. Central Mexico ..... *orizabensis*
- 7b. Canada, U. S. and northern Mexico ..... 8
- 8a. Conductor in lateral view S-shaped (Fig. 55) ..... *hentzii*
- 8b. Conductor in lateral view, elongated, with tip and base only slightly curved (Fig. 47) ..... *domiciliorum*

***Neoscona arabesca* (Walckenaer)**

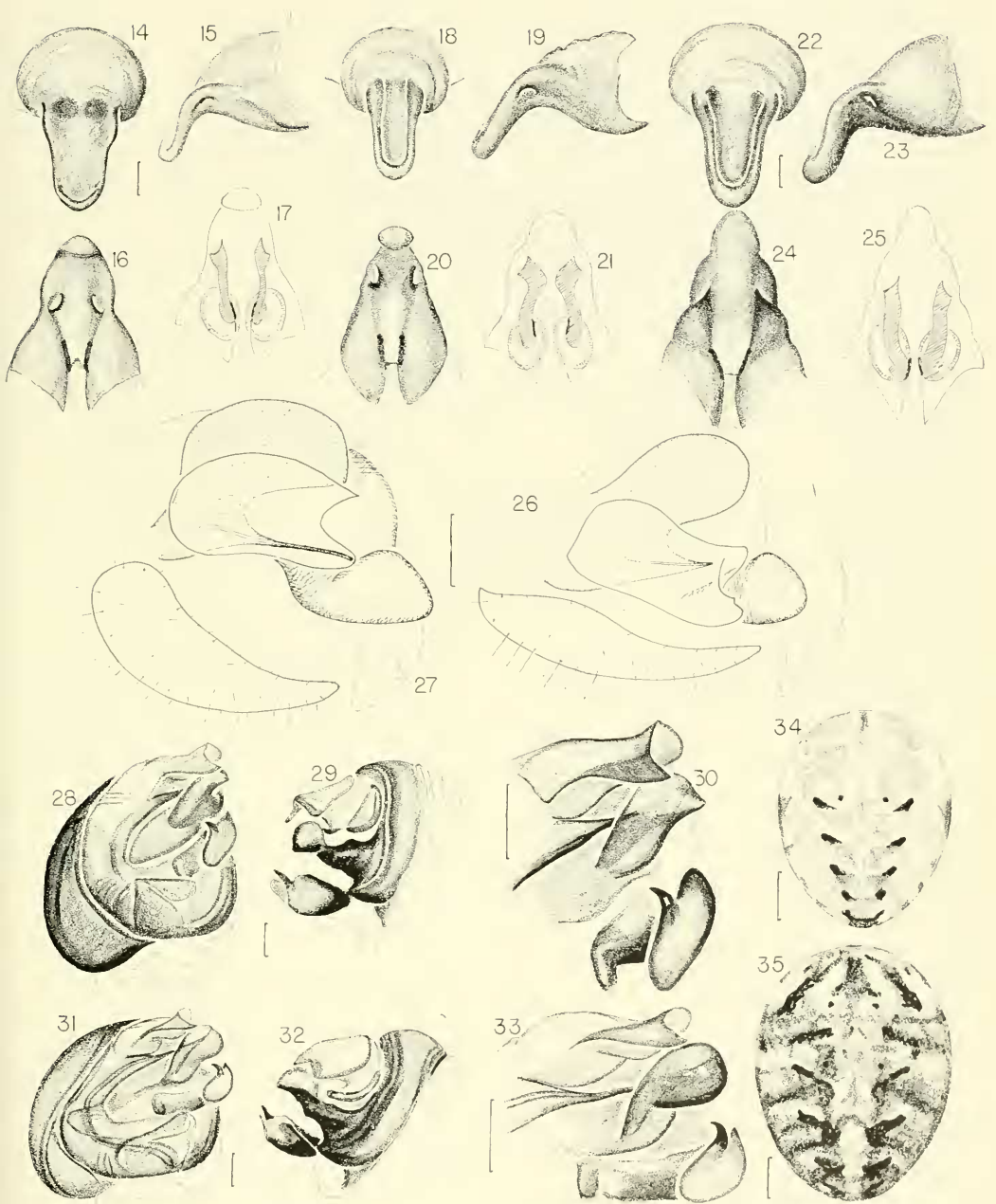
Plate 1, Figures 1-3, 5-6, 8, 10, 14-42, 125, 126, Map 1

*Epeira arabesca* Walckenaer, 1841, *Histoire Naturelle des Insectes Aptères*, 2: 74. The types are Bosc, *Araignée de Caroline* illustration, p. 13, pl. 5, fig. 2, in the library of the Muséum National d'Histoire Naturelle, Paris, and Abbot manuscript illustrations, figs. 331, 446 from Georgia in the British Museum, Natural History. Copies in the Museum of Comparative Zoology examined. McCook, 1893, *American Spiders*, 3: 148, pl. 1, fig. 8, pl. 2, figs. 6, 7, ♀, ♂.

*Epeira trivittata* Keyserling, 1863, *Sitzungsber. Naturf. Ges., Isis*, Dresden, p. 95, pl. 5, figs. 6-9, ♀. Female type from North America in the C. L. Koch collection probably in Berlin. Emerton, 1884, *Trans. Connecticut Acad. Sci.*, 6: 311, pl. 33, fig. 16, pl. 36, figs. 2, 3, 5, 8, ♀, ♂. Keyserling, 1892, *Spinnen Amerikas*, 4: 172, pl. 8, fig. 127, ♀. Emerton, 1902, *Common Spiders*, p. 166, figs. 393-395, ♀, ♂.

?*Epeira singularis* Banks, 1898, *Proc. California Acad. Sci.*, (3), 1(7): 252, pl. 15, fig. 4, ♀. Female holotype from Pescadero [? Baja California], was in the California Academy of Sciences and was destroyed. NEW SYNONYMY.

*Neoscona arabesca*, — F. P.-Cambridge, 1904, *Biologia Centrali-Americana, Araneidea*, 2: 472, pl. 44, figs. 13, 14, ♀, ♂. Comstock, 1912, *Spider Book*, p. 497, figs. 527-531, ♀. Comstock, 1940, *Spider Book*, rev. ed., p. 510, figs. 527-531, ♀. Kaston, 1948, *Bull. Connecticut Geol. Natur.*



*Neoscona arabesca* (Walckenaer). Figs. 14-25. Epigynum. 14, 18, 22. Ventral. 15, 19, 23. Lateral. 16, 20, 24. Posteriodorsal. 17, 21, 25. Posteriodorsal, cleared. 14-17. (Michigan). 18-21. (Michigan). 22-25. (Florida). Figs. 26-33. Left palpus. 26, 27. Apical view. 26. (Ontario). 27. (California). 28, 31. Ventral, cymbium removed. 29, 32. Lateral. 30, 31. Ventral view of palpal structures. 28-30. (Wisconsin). 31-33. (Texas). Figs. 34, 35. Dorsal view of female abdomen. 34. (Michigan). 35. (Texas).

Scales. 0.1 mm, for abdomens 1 mm.

Hist. Surv., 70: 245, figs. 750, 771-773, ♀, ♂. Bonnet, 1958, *Bibliographia Araneorum*, 2: 3055.

*Neoscona minima* F. P.-Cambridge, 1904, *Biologia Centrali-Americana, Araneida*, 2: 471, pl. 44, figs. 11, 12, ♀, ♂. Male, female syntypes from numerous Central American and Mexican localities, only female and males from Teapa, Mexico, examined in British Museum, Natural History. Gertsch and Mulaik, 1936, *American Mus. Novitates*, 863: 20, fig. 30, ♂. Kaston, 1948, *Bull. Connecticut Geol. Natur. Hist. Surv.*, 70: 245, figs. 751, 776, ♀, ♂. Bonnet, 1958, *Bibliographia Araneorum*, 2: 3058, NEW SYNONYMY.

*Neoscona naiba* Chamberlin and Gertsch, 1929, *J. Entomol. Zool.*, 21: 104, figs. 46-48, ♀. Female holotype from St. George, Utah, in the University of Utah collection, lost. NEW SYNONYMY.

*Note.* The measurements given, and the dorsal abdominal markings described for *Neoscona naiba* suggest that the name is a synonym of *N. arabesca*.

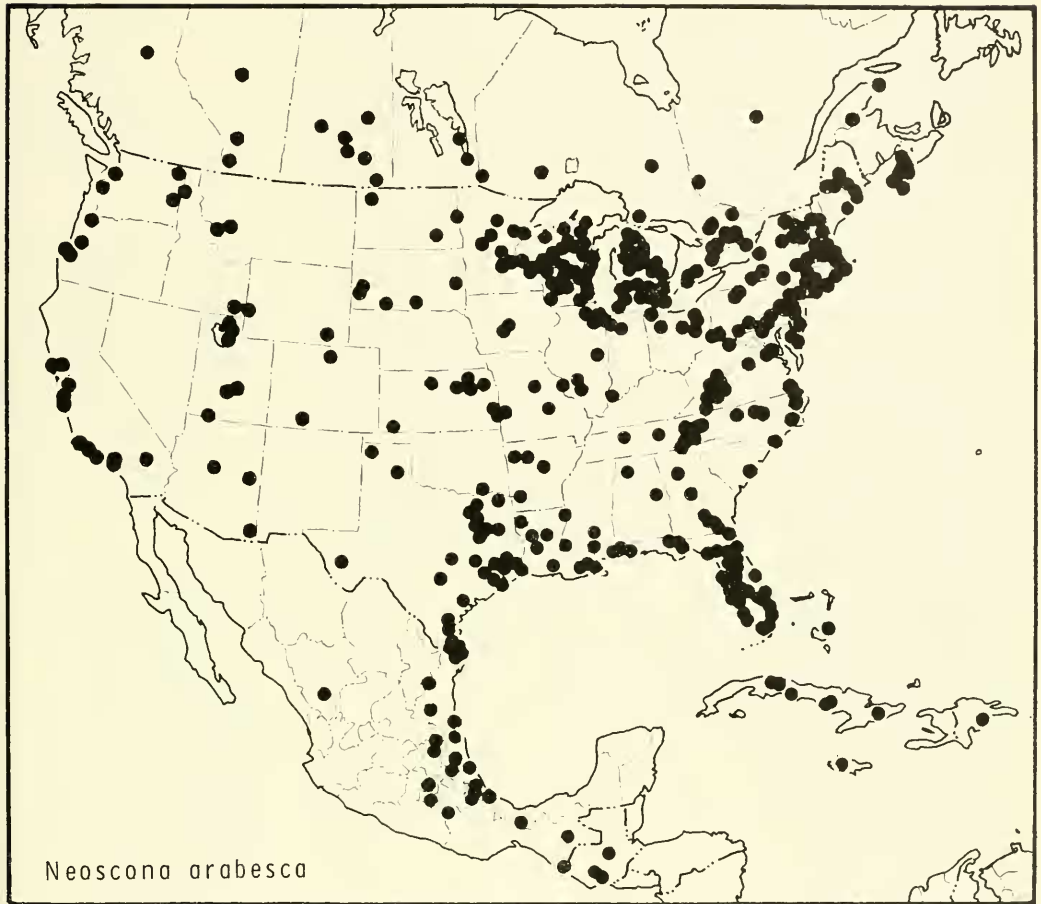
*Female.* Total length 5.2-12.3 mm. Carapace 1.9-4.6 mm long, 1.7-4.4 mm wide. A female from Wisconsin, 6.8 mm total length. Carapace 2.5 mm long, 2.3 mm wide. First femur, 2.9 mm; patella and tibia, 3.5 mm; metatarsus, 2.1 mm; tarsus, 0.8 mm. Second patella and tibia, 2.9 mm; third, 1.8 mm; fourth, 2.9 mm. A female from southern Texas, 8.0 mm total length. Carapace 2.9 mm long, 2.8 mm wide. First femur, 3.6 mm; patella and tibia, 4.4 mm; metatarsus, 3.3 mm; tarsus, 0.9 mm. Second patella and tibia, 3.6 mm; third, 2.2 mm; fourth, 3.5 mm.

*Male.* Total length 4.2-9.2 mm. Carapace 2.1-4.5 mm long, 1.8-4.0 mm wide. A male from Wisconsin, 5.4 mm total length. Carapace 2.6 mm long, 2.3 mm wide. First femur, 3.2 mm; patella and tibia, 4.0 mm; metatarsus, 2.8 mm; tarsus, 1.0 mm. Second patella and tibia, 3.0 mm; third, 2.0 mm; fourth 3.2 mm. A male from southern Texas, 5.4 mm total length. Carapace 2.7 mm long, 2.2 mm wide. First femur, 3.6 mm; patella and tibia, 4.0 mm; metatarsus, 3.1 mm; tarsus, 1.0 mm. Second patella and tibia, 3.0 mm; third, 1.9 mm; fourth, 3.0 mm.

*Variation.* Total length of female specimens from Canada and the northern tier of states, 5.2-7.7 mm, carapace 1.9-3.1 mm long, 1.7-2.5 mm wide; from southern United States and West Indies the three figures are: 5.6-8.2, 2.0-2.8, 1.8-2.5 mm; from Mexico: 5.8-12.3, 2.5-4.6, 2.1-4.4 mm. Males from the same northern area: 4.2-5.9, 2.1-3.0, 1.8-2.7 mm; from southern United States and West Indies: 3.9-5.2, 2.0-2.6, 1.8-2.4 mm; from Mexico: 4.6-9.2, 2.4-4.5, 2.1-4.0 mm.

Canadian specimens, those from the northern states, and the region south along the eastern seacoast are smallest and lightest and have a more variable epigynum, at times even lacking a border around the scape (Fig. 14). Males in this area generally have a more or less curved second tibia. Mexican specimens are most variable in size. Both the male embolus and the connecting ducts of the female are of variable length.

*Diagnosis.* The epigynum of the female has a short scape with no lateral lobes or bulges. The contraction near the midpoint is more abrupt and more pronounced in southern specimens (Fig. 36). In northern specimens the second tibia of the male is usually curved, with the prolateral surface concave. A single row of clasping macrosetae along the distal half connects with a proximal row of more variable (often larger) macrosetae (Figs. 125, 126). In southern specimens the second tibia of the male is nearly straight, with a single row of clasping macrosetae running its entire length; the macrosetae tend to get longer toward the distal end. The conspicuous presence of a large number of macrosetae on the ventral surface of tibia II is characteristic. The terminal apophysis has its sides almost parallel and has a deep notch distally (Figs. 26, 27), unlike that of other species of *Neoscona*. Since the distal part is partly transparent, it has to be carefully examined. Most specimens can readily be



Map 1. Distribution of *Neoscona arabesca* (Walckenaer).

assigned to this species by the small size, and oval abdomen with series of pairs of black dorsal marks. The dorsal marks may also be present in poorly preserved or bleached specimens of *N. domiciliorum* and *N. hentzi*.

*Natural history.* The vertical web is found in shrubs, meadows, and in sunny, preferably moist situations. Specimens are frequently collected by sweeping. This is one of the most common orb weavers. Collecting labels read: apple foliage (Nova Scotia), grassland, swamp grasses, beating juniper, sweeping meadow, tamarack.

*Distribution.* Southern Canada to Central

America, West Indies. Probably most abundant in the northern part of its range (Map 1).

#### *Neoscona domiciliorum* (Hentz)

Plates 2, 3, Figures 43–150, 127, Map 2

?*Epeira benjamina* Var. A., Walckenaer, 1841, *Histoire Naturelle des Insectes Aptères*, 2: 42. Type is Abbot's Georgian Spiders, fig. 126, manuscript in British Museum, Natural History. Copy in the Museum of Comparative Zoology examined. *Nomen dubium*.

*Epeira domiciliorum* Hentz, 1847, *J. Boston Natur. Hist. Soc.*, 5: 469, pl. 30, fig. 7, ♀. Type from Alabama destroyed. A female neotype from Tuscaloosa, Tuscaloosa County, Alabama, 1938–1939, here designated (one specimen from

Archer's five neotypes), and deposited in the American Museum of Natural History.

*Epeira benjamina*, — McCook, 1893, *American Spiders*, 3: 147 (in part), pl. 1, fig. 7 (Not pl. 2, figs. 4, 5).

*Neoscona domiciliorum*, — Archer, 1941, *Papers Alabama Mus. Natur. Hist.*, 14: 48, pl. 4, fig. 2, ♀. Chamberlin and Ivie, 1944, *Bull. Univ. Utah, Biol. Ser.*, 8(5): 108, fig. 65.

*Names.* To avoid switching of names and to straighten out present confusion (see discussion under *N. hentzii*), a neotype has been designated for *Epeira domiciliorum*. Without the neotype, the name *Epeira domiciliorum* would be a doubtful name. Archer (1941) interpreted Hentz's description to be this species, designated a neotype and deposited it in the Archer collection of the Alabama Museum of Natural History. Five specimens marked neotype by Archer were found in Alabama. One of these was taken out, relabelled neotype, and the specimens deposited in the American Museum of Natural History where other Archer specimens are kept. Hentz's comment on the epigynum's being like that of *Araneus diadematus* might indicate he had specimens with the longer scape, the commoner species, here called *N. hentzii*. According to Archer, the name *domiciliorum* also better fits *N. hentzii*, found in darker places in Alabama. However, many if not most *N. hentzii* of Florida and Alabama lack a pattern and Hentz does show a dorsal design in the illustration of *E. domiciliorum*.

*Female.* Total length 7.2–16.2 mm. Carapace 3.7–6.1 mm long, 2.2–5.1 mm wide. A female from Florida, 10.5 mm total length. Carapace 4.3 mm long, 4.1 mm wide. First femur, 5.6 mm; patella and tibia, 7.0 mm; metatarsus, 5.0 mm; tarsus, 1.6 mm. Second patella and tibia, 6.4 mm; third, 3.6 mm; fourth, 6.1 mm.

*Male.* Total length 8.0–9.0 mm. Carapace 4.8–5.0 mm long, 3.9–4.6 mm wide. A male from Florida, 8.9 mm total length. Carapace 4.8 mm long, 4.0 mm wide. First femur, 5.5 mm; patella and tibia, 7.2 mm;

metatarsus, 4.3 mm; tarsus, 1.5 mm. Second patella and tibia, 5.6 mm; third, 3.4 mm; fourth, 5.5 mm.

*Variation.* Southern specimens are larger than northern ones. The northernmost females do not seem to be as contrastingly colored as the southern ones.

*Diagnosis.* Females can be separated by the characteristic pattern and bright white or yellow color of the anterior dorsal surface of the abdomen (Fig. 50) and by the almost transverse bars on each side of the posterior. The scape of the epigynum is short, rounded at the tip with a lateral expansion near the base dorsally infolded to form a pair of lateral bulges, and is positioned slightly dorsal to the ventral surface (sometimes not very distinct) (Figs. 43, 44). The males may not be brightly colored. The second tibia of the male is nearly straight and has three rows of clasping spines (Fig. 127). It can probably be distinguished from the male of *N. pratensis* only by the latter's characteristic abdominal pattern and the spur on the fourth coxa. The conductor is, in lateral view, longer and more elongated (Fig. 47) than the conductor of *N. hentzii*. The terminal apophysis may have a lobe as in *N. hentzii*, but usually this lobe is absent (Fig. 49). Specimens do not overlap in size with sympatric specimens of *N. arabesca*. Bleached, poorly preserved specimens may have dark spots like those of *N. arabesca*.

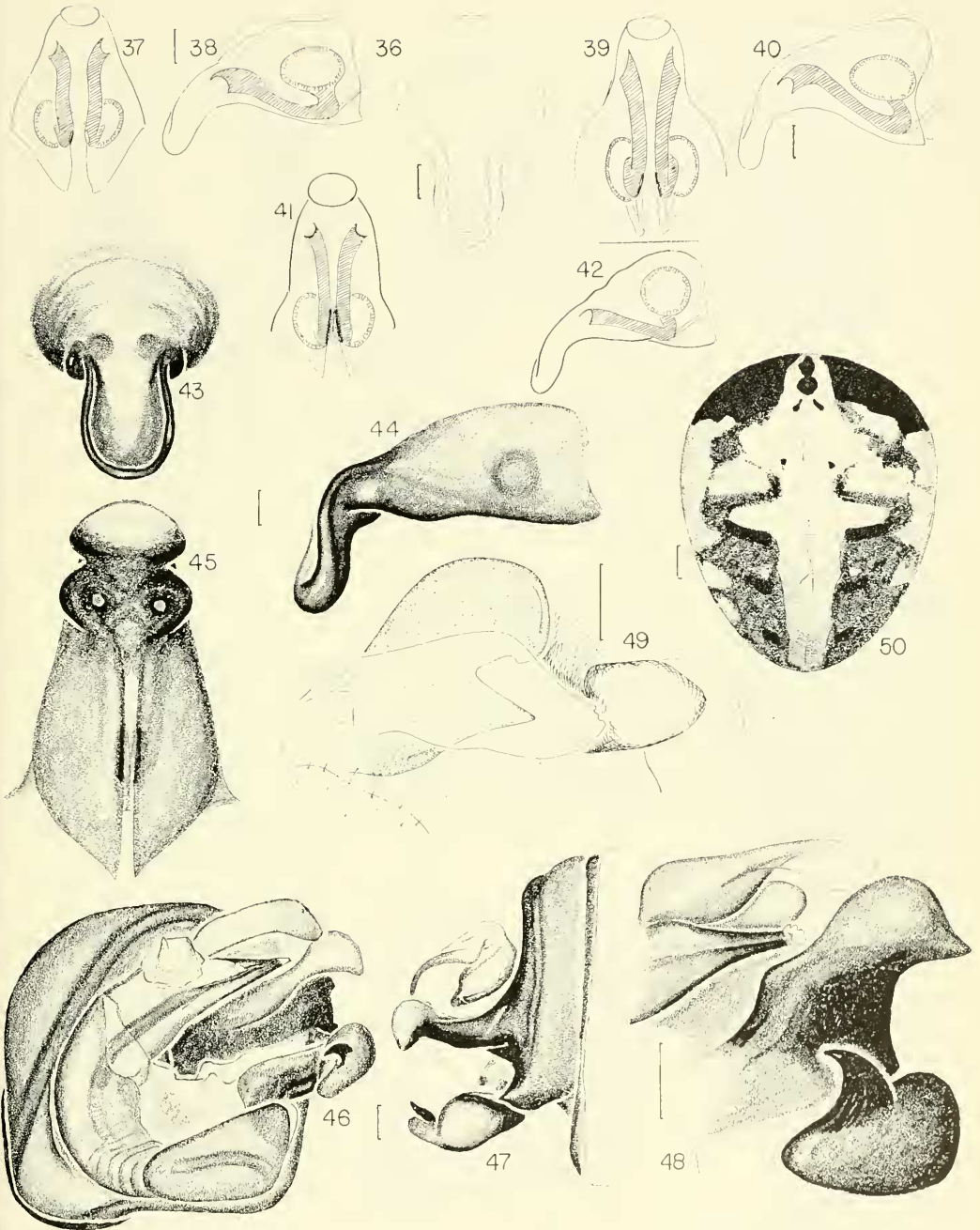
*Natural history.* Specimens have been collected from woods in Torreya State Park, Florida; a dry area with oaks and palms and little ground vegetation, Florida; prairie and disturbed area, Florida. A record from Texas indicates flood plain as a collecting site.

*Distribution.* Eastern Massachusetts and Indiana to Florida and Texas (Map 2).

### *Neoscona hentzii* (Keyserling)

Figures 51–58, 128, Map 3

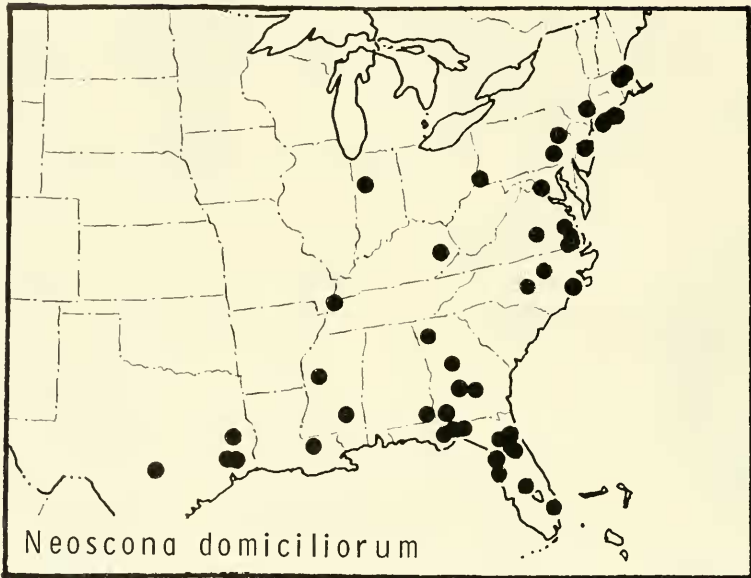
?*Epeira benjamina* Var. B, Walckenaer, 1841, *Histoire Naturelle des Insectes Aptères*, 2: 43.



*Neoscona arabesca* (Walckenaer). Figs. 36-42. Epigynum. 36. Syntype of *N. minima* (Tabasco). 37, 39, 41. Posteriodorsal, cleared. 38, 40, 42. Lateral, cleared. 37, 38. (Texas). 39, 40. (Oregon). 41, 42. (New Hampshire).

*Neoscona domiciliarum* (Hentz). Figs. 43-45. Epigynum. 43. Ventral. 44. Lateral. 45. Posteriodorsal. Figs. 46-49. Left palpus. 46. Ventral, cymbium removed. 47. Lateral. 48. Ventral view of palpal structures. 49. Apical view. Fig. 50. Female abdomen.

Scales. 0.1 mm, for abdomen 1 mm.



Map 2. Distribution of *Neoscona domiciliorum* (Hentz).

Type is Abbot's manuscript-drawing fig. 351 from Georgia, manuscript in British Museum, Natural History. Copy in the Museum of Comparative Zoology examined. Not Var. A. *Nomen dubium*.

?*Epeira rubicunda* Walckenaer, 1841, *Histoire Naturelle des Insectes Aptères*, 2: 43. Provisional name for variety B of *E. benjamina*. *Nomen dubium*.

?*Epeira mutabilis* Walckenaer, 1841, *Histoire Naturelle des Insectes Aptères*, 2: 73. Type is Abbot's manuscript-drawing fig. 351 from Georgia, manuscript in British Museum, Natural History. Copy in the Museum of Comparative Zoology examined. An objective synonym of *E. rubicunda*. *Nomen dubium*.

*Epeira hentzii* Keyserling, 1863, *Sitzungsber. Naturf. Ges., Isis, Dresden*, p. 97, pl. 5, fig. 10, 11, ♀. Female lectotype here designated from Baltimore, Maryland, in the L. Koch collection of the British Museum, Natural History, examined. Also one female paralectotype.

*Epeira domiciliorum*, — McCook, 1881, *Proc. Acad. Natur. Sci. Philadelphia*, p. 173, fig. 13 (web). Emerton, 1884, *Trans. Connecticut Acad. Sci.*, 6: 312, pl. 33, fig. 17, pl. 36, figs. 1, 4, ♀, ♂. (Not *Epeira domiciliorum* Hentz.)

*Epeira benjamina*, — Marx, 1890, *Proc. U. S. Natl. Mus.*, 12: 543. Keyserling, 1892, *Spinnen Amerikas*, 4: 134, pl. 7, fig. 100, ♀. McCook,

1893, *American Spiders*, 3: 147, pl. 2, figs. 4, 5 (not pl. 1, fig. 7). Not *Epeira benjamina* Var. A, Walckenaer.

?*Epeira punctigera*, — Keyserling, 1892, *Spinnen Amerikas*, 4: 136, pl. 7, fig. 100. Not *Epeira punctigera* Doleschall.

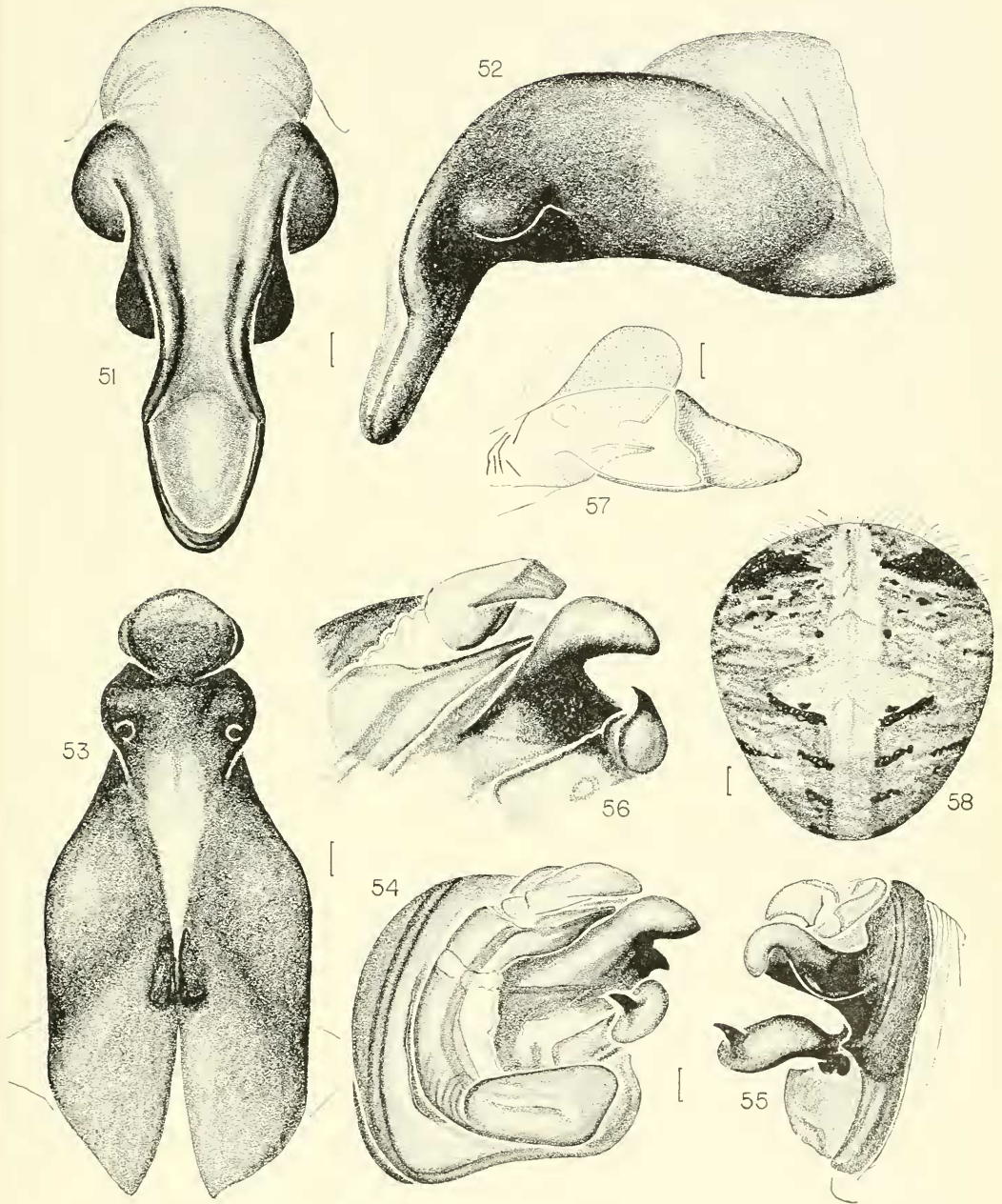
*Neoscona benjamina*, — F. O. P.-Cambridge, 1904, *Biologia Centrali-Americana, Araneidea*, 2: 470, pl. 44, fig. 8, ♀. Comstock, 1912, *Spider Book*, p. 498, figs. 532-535, ♀, ♂. Comstock, 1940, *Spider Book*, rev. ed., p. 511, figs. 532-535, ♀, ♂. Archer, 1941, *Paper Alabama Mus. Natur. Hist.*, 14: 48. Kaston, 1948, *Bull. Connecticut Geol. Natur. Hist. Surv.*, 70: 246, figs. 752, 777-778, ♀. (Not *Epeira benjamina* Var. A, Walckenaer.)

*Neoscona arkansa* Chamberlin and Ivie, 1942, *Bull. Univ. Utah, Biol. Ser.*, 7(1): 77, figs. 217, 218, ♀. Female holotype from Imboden, Arkansas, in the University of Utah collection kept at the American Museum of Natural History, examined. NEW SYNONYMY.

*Neoscona nebraskensis* Chamberlin and Ivie, 1942, *Bull. Univ. Utah, Biol. Ser.*, 7(1): 77, figs. 219, 220, ♀. Female holotype from Fremont, Nebraska, in the University of Utah collection kept at the American Museum of Natural History, examined. NEW SYNONYMY.

*Neoscona sacra*, — Chamberlin and Ivie, 1944, *Bull. Univ. Utah, Biol. Ser.*, 8(5): 108. (Not fig. 61; not *sacra* Walckenaer.)





*Neoscona hentzii* (Keyserling). Figs. 51–53. Epigynum. 51. Ventral. 52. Lateral. 53. Posteriodorsal. Figs. 54–57. Left palpus. 54. Ventral, cymbium removed. 55. Lateral. 56. Ventral view of palpal structures. 57. Apical view. 54, 55. (New Jersey). 56. (Louisiana). Fig. 58. Female abdomen.

Scales. 0.1 mm, for abdomen 1 mm.

*Names.* Walckenaer described *Epeira benjamina* with two varieties. One, variety A, is light colored and contrastingly marked on the abdomen, the other, variety B, is brown and indistinctly marked. However, he gave variety B the provisional name *rubicunda*. Both forms were descriptions of Abbot manuscript illustrations, var. A, fig. 126, var. B, fig. 351. Marx (1890) first synonymized *domiciliorum* Hentz, and *hentzii* Keyserling with *benjamina* Walckenaer. When McCook illustrated the species, he gave one illustration (pl. 1, fig. 7) for the contrastingly colored specimens, another (pl. 2, figs. 4, 5), for an "old" female that corresponds to var. B of Walckenaer.

Archer (1941) decided, correctly, that two species are involved and used *domiciliorum* Hentz for the one with contrasting colors and *benjamina* for the indistinctly marked one. Had he reversed the names he would have been more convincing. Chamberlin and Ivie (1944) studied Abbot's figures and concluded correctly that Walckenaer's variety A is not what Archer called *benjamina*. They decided to use Walckenaer's name *sacra* instead. This unfortunately added to the confusion. They also claimed "it is doubtful whether the true *benjamina* occurs in the United States." However, since the type of *benjamina* is Abbot's figure 126 from a Georgia spider, it must occur in the United States. They did not use the name *rubicunda*, perhaps because Walckenaer indicated that he had specimens also from the West Indies (presumably *N. nautica* L. Koch).

Unfortunately, the type of *Epeira sacra* Walckenaer, Abbot's manuscript figure 136, has the second legs longer than the first, does not look like an araneid (although it was supposed to come from an orb-web), and the abdomen is a bright orange-brown with narrow black transverse bands on the sides. It is true that Chamberlin and Ivie's photograph of Abbot's figure (fig. 61) looks surprisingly like the photograph of *N. benjamina* in Comstock (1912, 1940). This is the only

resemblance. The color alone, also described by Walckenaer, speaks strongly against the synonymy. The transverse bars resemble those of *N. domiciliorum* (Plate 2). Further, the thoracic depression in Abbot's figure (of a male) is Y-shaped. However, in *Neoscona* kept in alcohol, the convex carapace has a longitudinal groove and in fresh, living specimens it may be completely hidden by hairs (Plates 1-3). It is never Y-shaped.

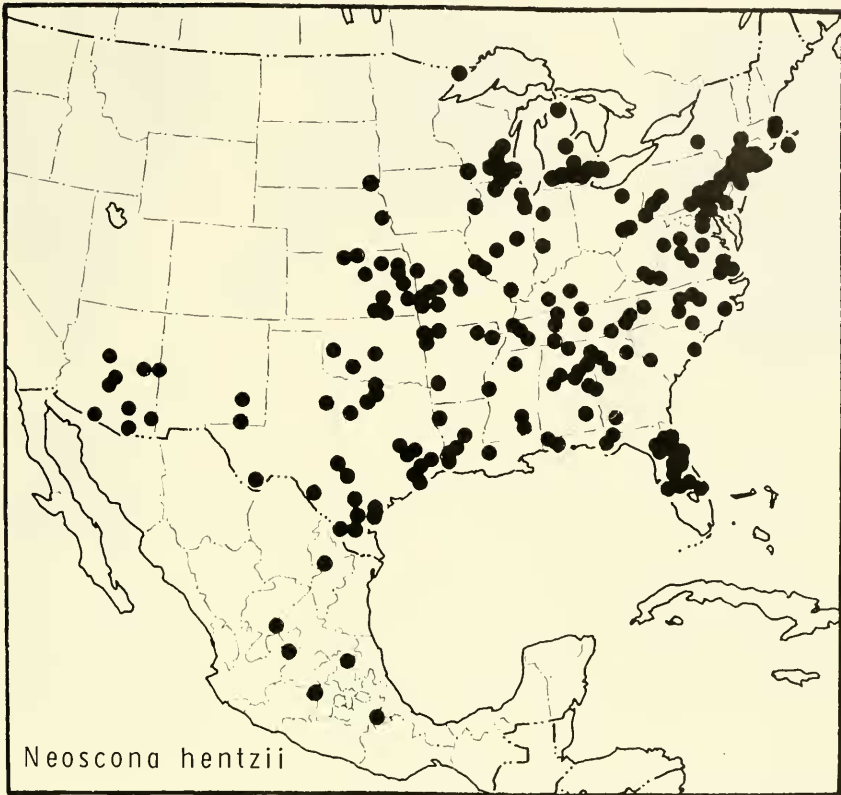
To resolve the problem without switching names and with the hope of providing stability, we have designated a neotype for *Epeira domiciliorum* Hentz, using a specimen determined by Archer. Since the types of both *benjamina* and *sacra* are Abbot illustrations, no neotype can be designated. We therefore use the oldest name with adequate description that leaves no doubt about its interpretation, *Epeira hentzii* Keyserling, for the second and much more common species.

*Epeira punctigera* was a misidentification. The specimens from the Marx collection came from Washington Territory (certainly an error); they may have been *N. nautica*.

*Female.* Total length 8.5-19.7 mm. Carapace 3.7-8.0 mm long and 3.1-7.3 mm wide. A female from New Jersey, 12.0 mm total length. Carapace 5.9 mm long, 4.5 mm wide. First femur, 6.2 mm; patella and tibia, 7.6 mm; metatarsus, 5.0 mm; tarsus, 1.6 mm. Second patella and tibia, 7.0 mm; third, 4.1 mm; fourth, 6.5 mm.

*Male.* Total length 4.5-15.0 mm. Carapace 2.3-6.8 mm long, 2.0-6.0 mm wide. A male from Louisiana, 15 mm total length. Carapace 6.2 mm long, 5.4 mm wide. First femur, 6.9 mm; patella and tibia, 9.7 mm; metatarsus, 6.0 mm; tarsus, 1.8 mm. Second patella and tibia, 7.0 mm; third, 4.3 mm; fourth, 6.9 mm.

*Variation.* Southeastern specimens are much larger than northern ones and those from Arizona. There are individual differences in coloration but all lack a distinct pattern and none has a brightly colored



Map 3. Distribution of *Neoscona hentzii* (Keyserling).

abdomen; the color in alcohol may be white. The variation is greatest in the area outside the range of *N. domiciliorum*. The holotypes of both *N. nebraskensis* and *N. arkansa* are individuals with white abdomens and the proximal epigynal bulges reduced in size.

**Diagnosis.** The scape of the epigynum is very long and has two pairs of lateral bulges, one pair, often indistinct, near the base and the other pair, very conspicuous, just to the basal side of the midpoint contraction. The position of the second pair, which arises from the margins of the ventral surface and terminates distally beneath (i.e., dorsal to) it, is sufficient to separate *N. hentzii* from all other *Neoscona*, even when the basal pair of lobes cannot be discerned. The narrowing near the mid-

point is more pronounced than in other species and the apex is quite pointed, giving the distal segment of the scape a decidedly spoon-shaped appearance (Fig. 51). The second tibia of the male has two rows of straight clasping macrosetae (one row distally sparse), which run the entire length of the prolateral edge (Fig. 128). The conductor of the palpus in lateral view (Fig. 55) is S-shaped and short, and has the distal portion relatively long, quite different from the elongate conductor of *N. domiciliorum*. The terminal apophysis lacks the notch of *N. arabesca* (Fig. 57), but there is a lobe. There is no overlap in size of specimens with sympatric specimens of *Neoscona arabesca*. Unlike the western *N. oaxacensis*, the male lacks spurs on the fourth coxa. In some poorly pre-

served specimens that have lost most of their color, abdominal spots resembling those of *N. arabesca* appear. Usually these are hidden by other pigment. Color photographs, probably of this species, are on plate 23 in Gertsch, W. J. (1949. *American Spiders*, Van Nostrand).

*Natural history.* This species is less common than *N. arabesca* but much more common than *N. domiciliorum*. It "occurs in open woods though seldom in grass" according to Kaston (1948). Collections come from palm and high pine—turkey oak trees in Florida, dry sandy area, open hammocks with high water table in Florida, xeromesic hammock, low hammock, all Florida; xeromesic woods and birch maple swamp, Michigan; around houses in woods, Virginia; in tall grass, Ohio; palmetto-cypress swamp in Texas, open pine woods and sparse juniper (*Juniperus pediflorum*) branches on rocky hillside in Arizona; along ditches, Louisiana; rocky slope with oaks, dry second growth in Alabama. Collections of adults are relatively late in the season.

*Distribution.* Southern Massachusetts, Ontario, Minnesota, east of the Rocky Mountains to Arizona, central Mexico and central Florida in the south (Map 3).

#### *Neoscona orizabensis* F. P.-Cambridge

Figures 7, 59–67, 133; Map 4

*Neoscona orizabensis* F. P.-Cambridge, 1904, *Biologia Centrali-Americana, Araneidea*, 2: 473, pl. 44, fig. 17, ♀. Four female syntypes from Orizaba, [Veracruz], Mexico, in the British Museum, Natural History, examined. Bonnet, 1958, *Bibliographia Araneorum* 2: 3060.

*Neoscona amulensis* F. P.-Cambridge, 1904, *Biologia Centrali-Americana, Araneidea*, 2: 472, pl. 64, fig. 15, ♂. Male holotype from Amula, [9.5 km NW of Chilapa, 200 m, Guerrero\*], Mexico, in the British Museum, Natural History, examined. Bonnet, 1958, *Bibliographia Araneorum*, 2: 3055. NEW SYNONYMY.

*Note.* Because females are easier to recognize than males, I chose the name *orizabensis* for this species. The type of *amulensis* is in poor condition.

*Female.* Total length, 10.3–15.1 mm; carapace 4.2–5.5 mm long, 3.6–4.9 mm wide. A female syntype measured 13.0 mm total length; carapace 4.3 mm long, 4.3 mm wide. First femur, 6.0 mm; patella and tibia, 7.2 mm; metatarsus, 5.2 mm; tarsus, 1.8 mm. Second patella and tibia, 6.5 mm; third, 3.6 mm; fourth, 6.5 mm.

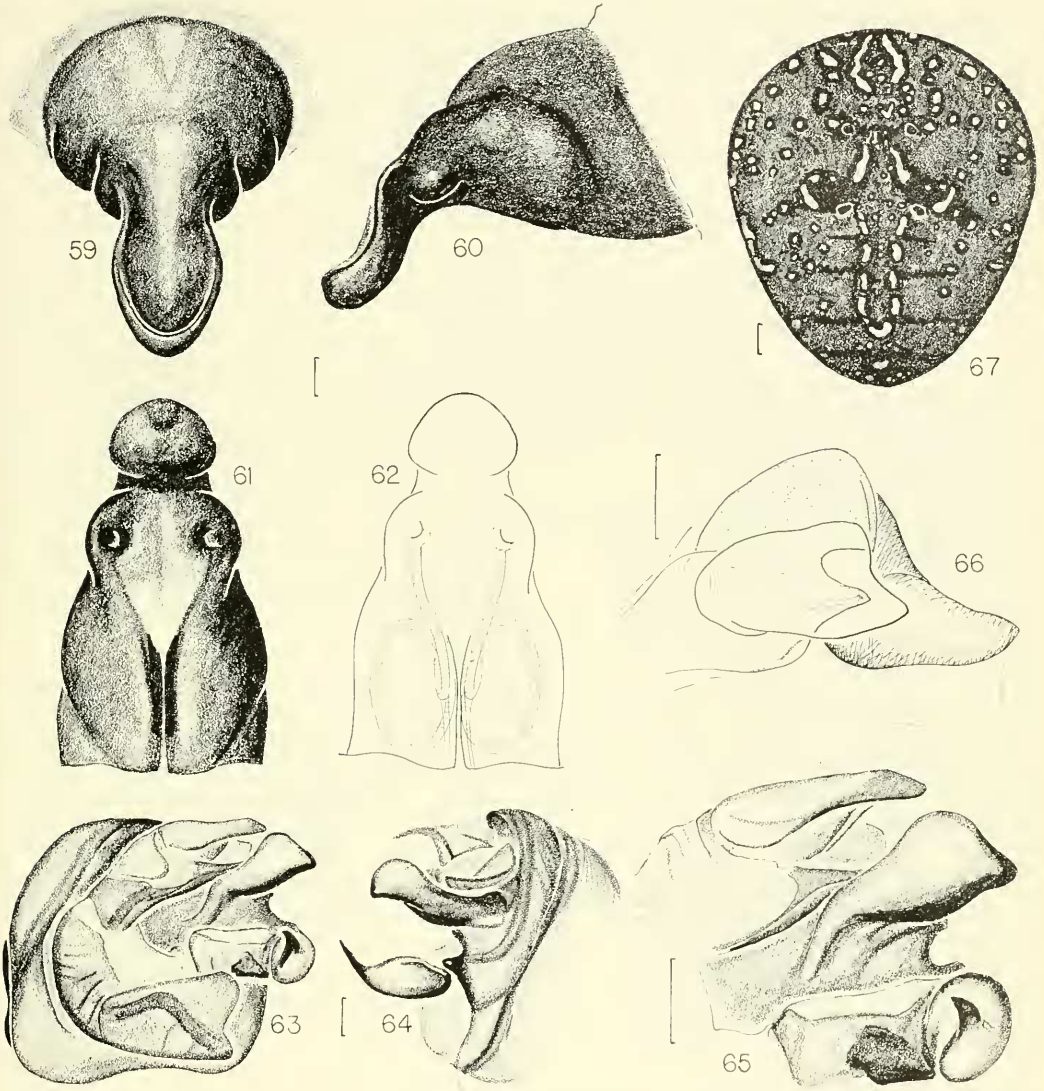
*Male.* Total length, 6.1–8.0 mm; carapace 3.3–3.7 mm long, 2.5–3.2 mm wide. A male measured 6.2 mm total length; carapace 3.4 mm long, 2.5 mm wide. First femur, 3.7 mm; patella and tibia, 4.4 mm; metatarsus, 2.9 mm; tarsus, 1.0 mm. Second patella and tibia, 3.5 mm; third, 2.2 mm; fourth, 3.3 mm.

*Diagnosis.* The carapace is dark brown with two broad longitudinal tan colored bands that join near the thoracic groove (Fig. 7). (In other species the carapace is usually tan with darker areas near the margins and along the median longitudinal line; in *N. hentzii* and *N. nautica* it is usually uniform brown.) The dorsal pattern of the abdomen characteristically contains numerous small, often paired, light colored spots (Fig. 67). The position of lobes on the scape is as in *N. hentzii*, but the scape is considerably shorter and stouter, and the apex less pointed (Fig. 59). The second tibia of the male has a single row of about five clasping macrosetae along the distal portion, more or less disjoined from a more proximal row of longer, curved macrosetae (Fig. 133). The terminal apophysis is very wide with the sides almost parallel, the main part of the embolus is cone-shaped (Fig. 66). The male differs from sympatric *N. oaxacensis* in lacking spurs on the fourth coxae, and from *N. arabesca* in the details of embolus and terminal apophysis mentioned above.

*Natural history.* No natural history data was found with the collections.

*Distribution.* Central Mexico (Map 4).

\* Selander, R. B., and P. Vaurie, 1962. A gazetteer to accompany the Insecta volumes of the *Biologia Centrali-Americana*. *American Mus. Novitates* 2099: 1–70.



*Neoscona arizabensis* F. P.-Cambridge. Figs. 59-62. Epigynum. 59. Ventral. 60. Lateral. 61. Posteriodorsal. 62. Posteriodorsal, cleared. Figs. 63-66. Left palpus. 63. Ventral view, cymbium removed. 64. Lateral. 65. Ventral view of palpal structures. 66. Apical view. Fig. 67. Female abdomen.  
Scales. 0.1 mm, abdomen 1 mm.

***Neoscona utahana* (Chamberlin)**  
 Figures 68-77, 135; Map 5

*Aranca* (*Neoscona*) *utahana* Chamberlin, 1919, *Ann. Entomol. Soc. America*, 12: 254, p. 19, figs. 1, 2, ♀. Female holotype from Fillmore, Utah, in the Museum of Comparative Zoology, examined.

*Neoscona eximia* Gertsch and Mulaik, 1936, *American Mus. Novitates*, 863: 19, fig. 32, ♂. Male holotype and female paratype from Edinburg, Texas, in the American Museum of Natural History, examined. NEW SYNONYMY.  
*Neoscona jonesi* Archer, 1951, *American Mus. Novitates*, 1487: 22, figs. 35, 50, 58, ♂. Fragments of two male syntypes from Kisatchie



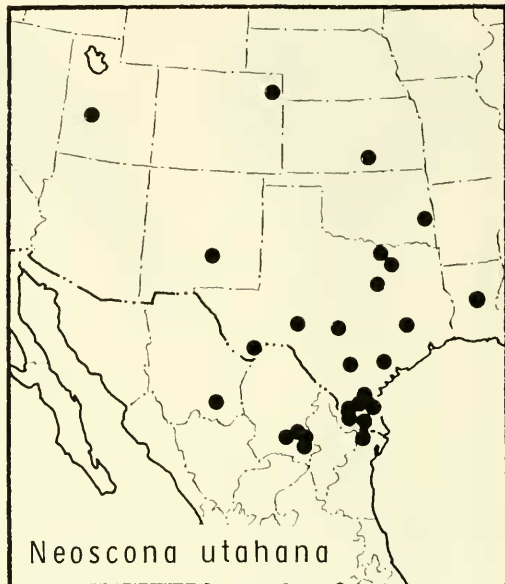
Map 4. Distribution of *Neoscona arizabensis* F. P.-Cambridge.

National Forest, Grant Parish, Louisiana, in the American Museum of Natural History, examined. NEW SYNONYMY.

*Female.* Total length, 8.8–10.4 mm; carapace 3.2–5.8 mm long, 3.0–4.2 mm wide. A female from Texas, 9.0 mm total length. Carapace 3.6 mm long, 3.3 mm wide. First femur, 5.0 mm; patella and tibia, 6.1 mm; metatarsus, 5.5 mm; tarsus, 1.4 mm. Second patella and tibia, 5.8 mm; third, 3.2 mm; fourth, 4.9 mm.

*Male.* Total length 6.2–8.0 mm; carapace 3.6–4.0 mm long, 2.9–3.3 mm wide. A male from Texas, 7 mm total length. Carapace 3.7 mm long, 3.0 mm wide. First femur, 5.0 mm; patella and tibia, 5.7 mm; metatarsus, 5.0 mm; tarsus, 1.4 mm. Second patella and tibia, 4.3 mm; third, 2.7 mm; fourth, 4.2 mm.

*Diagnosis.* In coloration (brown carapace, brown legs and dark brown, triangular abdomen, darker on the sides) *Neoscona utahana* resembles only *N. nautica*. However, the dorsal folium pattern of the abdomen, sharply delimited by a lighter line on its sides (Fig. 77) distinguishes *N. utahana*. The epigynum (Fig. 68) is longer than that of *N. nautica* and, unlike that of *N. arabesca*, is narrowed above the tip and is rounded at its tip. The flaplike terminal apophysis (Fig. 76) separates males from those of *N. nautica*. The



Map 5. Distribution of *Neoscona utahana* (Chamberlin).

shape and pattern on the abdomen (Fig. 77), present on all males examined, separates males from related and sympatric species. The main part of the embolus is cone-shaped and extends slightly beyond the lamella.

*Natural history.* Specimens have been taken under eaves in Texas.

*Distribution.* From Utah, Colorado, and Kansas south to northern Mexico (Map 5).

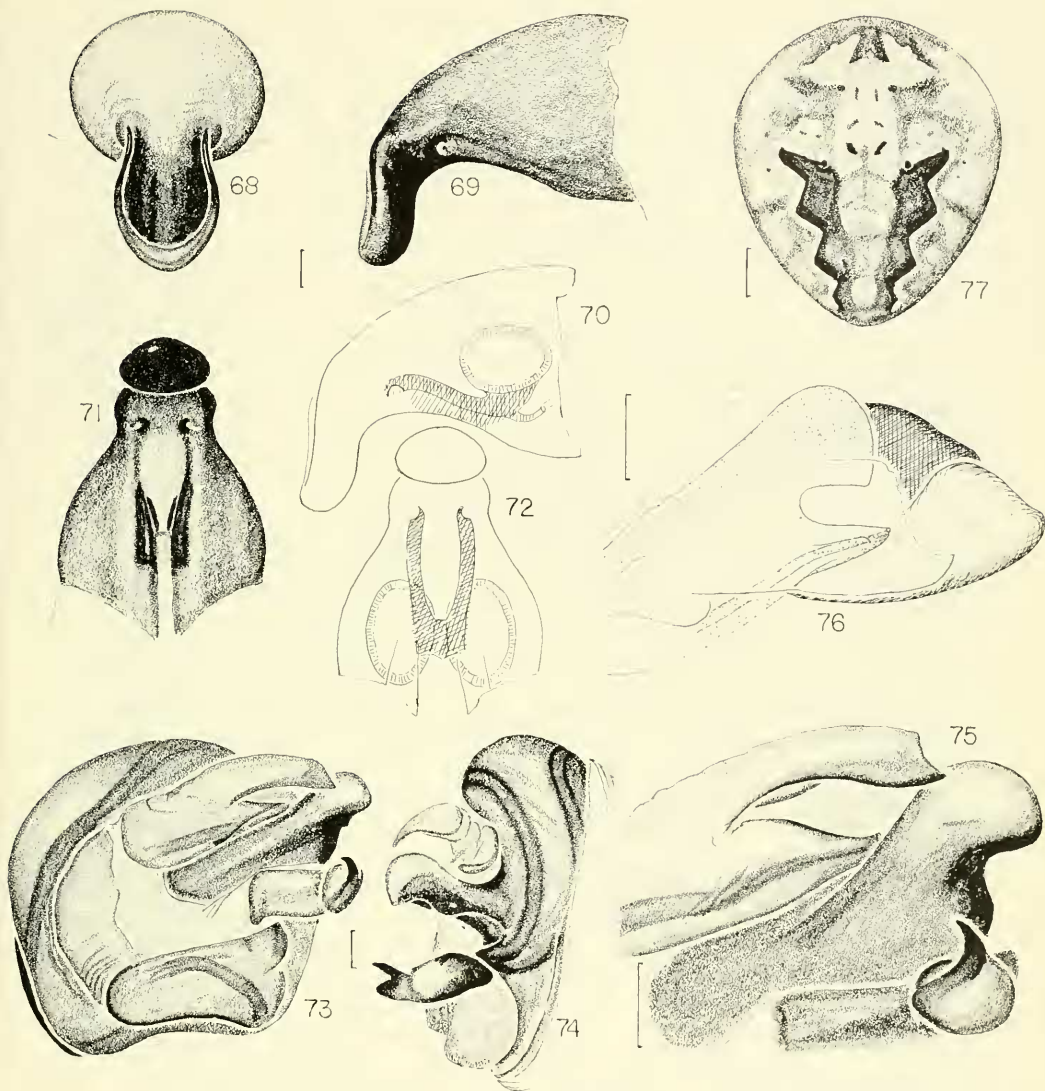
#### *Neoscona oaxacensis* (Keyserling)

Plate 4; Figures 4, 9, 11, 78–90, 129; Map 6

*Epeira oaxacensis* Keyserling, 1863, Sitzungsber. Naturwiss. Ges., Isis, Dresden, p. 121, pl. 5, figs. 15, 16, ♀. Female holotype from Oaxaca, Mexico, in the British Museum, Natural History, lost. Keyserling, 1893, Spinnen Amerikas, 4: 238, pl. 12, fig. 178, ♀ ["oaxensis"].

*Epeira cooksonii* Butler, 1877, Proc. Zool. Soc. London, p. 76, pl. 13, fig. 2, ♀. Six female syntypes from Alhambra Island, Galapagos, in the British Museum, Natural History, examined. NEW SYNONYMY.

*Epeira adiantoides* Taczanowski, 1878, Horae Soc. Entomol. Rossicae 14: 148, pl. 1, fig. 4, ♀. Four female syntypes from Chorillos [now



*Neoscana utahana* (Chamberlin). Figs. 68–72. Epigynum. 68. Ventral. 69. Lateral. 70. Lateral, cleared. 71. Posteriadorsal. 72. Posteriadorsal, cleared. Figs. 73–76. Left palpus. 73. Ventral view, cymbium removed. 74. Lateral. 75. Ventral view of palpal structures. 76. Apical view. Fig. 77. Female abdomen. Scales. 0.1 mm, abdomen 1 mm.

suburb of Lima], Peru, and numerous juvenile female and juvenile male specimens from this locality in the Polish Academy of Sciences, Warsaw, examined. NEW SYNONYMY.

*Epeira vertebrata* McCook, 1888, Proc. Acad. Natur. Sci. Philadelphia, p. 196, figs. 6–10, ♀, ♂. Syntypes from San Diego, California, in the Academy of Natural Sciences, Philadelphia.

McCook, 1893, American Spiders, 3: 151, pl. 3, figs. 6, 7, pl. 4, fig. 1, pl. 5, fig. 4, ♀, ♂.

*Neoscana oaxacensis*, — F. P.-Cambridge, 1904, Biologia Centrali-Americana, Araneidea, 2: 468, pl. 44, figs. 4, 5, ♂, ♀. Gertsch and Mulaik, 1936, American Mus. Novitates, 863: 21. Bonnet, 1958, Bibliographia Araneorum, 2: 3059. *Neoscana cooksoni*, — F. P.-Cambridge, 1904,

*Biologia Centrali-Americana, Araneidea*, 2: 473, pl. 44, fig. 16, ♀.

*Neoscona conifera* F. P.-Cambridge, 1904, *Biologia Centrali-Americana, Araneidea*, 2: 469, pl. 44, figs. 6, 7, ♀, ♂. Two female, 4 male syntypes from Chilpancingo, Mexico, examined. Bonnet, 1958, *Bibliographia Araneorum*, 2: 3057. NEW SYNONYMY.

*Neoscona salacria* Chamberlin, 1920, *Entomol. News*, 31: 167, figs. 1, 2, ♀. Male holotype from Saltair Beach, Utah, in the Museum of Comparative Zoology, examined. NEW SYNONYMY.

*Neoscona lativulva* Chamberlin and Ivie, 1942, *Bull. Univ. Utah, Biol. Ser.*, 7(1): 78, figs. 221, 222, ♀. Female holotype from Laguna Beach, California, in the University of Utah collection kept at the American Museum of Natural History, examined. NEW SYNONYMY.

*Note.* Gertsch (1936) suspected the synonymy of some names listed above. Specimens of *N. conifera* differ by being smaller. The holotype of *Neoscona lativulva* is a small individual having only two ventral spots rather than the more common four and having a narrower, more pointed epigynum, an epigynal variation that occasionally appears in individuals throughout the range of *N. oaxacensis*.

*Female.* Total length 8.9–18.0 mm. Carapace 3.8–7.7 mm long, 3.3–5.5 mm wide. A female from southern California, 13 mm total length. Carapace 5.3 mm long, 4.5 mm wide. First femur, 6.1 mm; patella and tibia, 8.0 mm; metatarsus, 6.2 mm; tarsus, 1.8 mm. Second patella and tibia, 7.2 mm; third, 4.3 mm; fourth, 7.2 mm.

*Male.* Total length 6.3–12.7 mm. Carapace 3.5–6.3 mm long, 2.9–5.0 mm wide. A male from southern California, 10 mm total length. Carapace 5.3 mm long, 4.5 mm wide. First femur, 6.3 mm; patella and tibia, 8.0 mm, metatarsus, 6.5 mm; tarsus, 1.8 mm. Second patella and tibia, 5.8 mm; third, 4.2 mm; fourth, 6.5 mm.

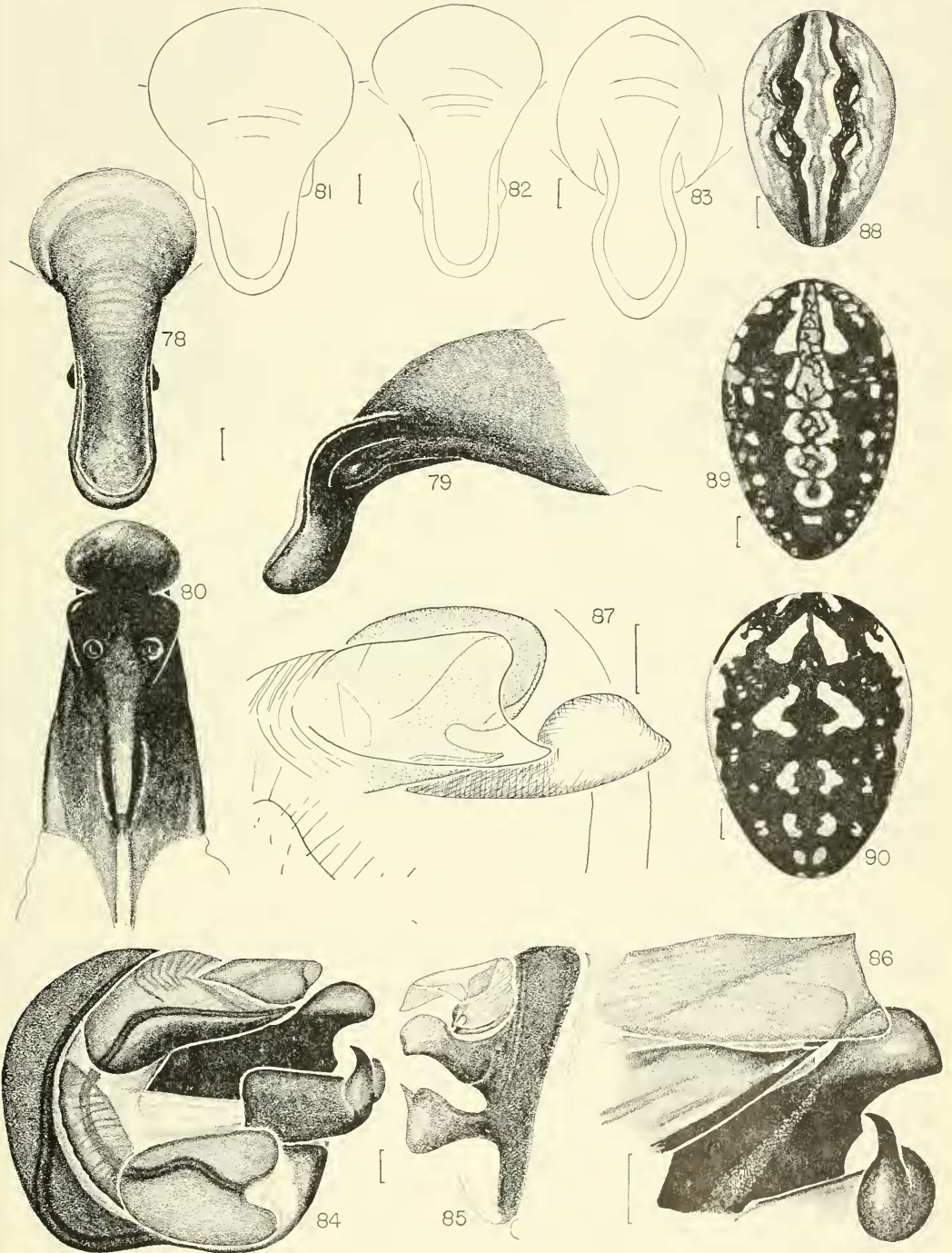
*Variation.* There is variation in size. Mexican, and Central and South American specimens have a more distinct light median dorsal band on the abdomen as well as a slenderer abdomen than North American specimens. In some specimens the epigynal scape is constricted and more pointed (Fig. 83). These specimens may belong to a different species. They have been named *N. lativulva* by Chamberlin and Ivie.

*Diagnosis.* The black and white dorsal pattern on the narrow abdomen separates all but the most faded females (Figs. 89, 90). The single pair of lobes on the scape is positioned somewhat beneath (dorsal to) the ventral surface (Figs. 78, 79). In specimens that have heavily sclerotized epigyna the lobes are sometimes obscured, but in such cases the abdominal pattern generally suffices to separate the species. The males, like those of the allopatric *N. pratensis* and *N. neotheis*, have a spur on coxa IV (Fig. 9) that distinguishes them from all sympatric species. The second tibia is strongly curved, with the prolateral surface concave. Two rows of clasping macrosetae run the length of the tibia (some additional similar macrosetae may be present near the proximal end). The macrosetae are characteristically curved toward the dorsal surface of the tibia (Fig. 129). The dorsal abdominal pattern resembles that of certain *Aculepeira* with which the species has been confused.

*Natural history.* In California specimens have been taken from citrus trees and from carrot seed heads and in Arizona from an alfalfa field. It has been collected from shrubs and tall grass in Texas, on a bridge in Arizona, on cedars in a cemetery in Kansas and on the outside wall of a house

→  
*Neoscona oaxacensis* (Keyserling). Figs. 78–83. Epigynum. Figs. 78, 81, 82, 83. Ventral. 79. Lateral. 80. Posteriodorsal. 78–80. (California). 81. Syntype of *Epeira adiantoides* (Peru). 82. Syntype of *Epeira cooksoni* (Galapagos Isl.). 83. (Mexico City). Figs. 84–87. Left palpus. 84. Ventral, cymbium removed. 85. Lateral. 86. Ventral view of palpal structures. 87. Apical view. Figs. 88–90. Female abdomen. 88. Syntype of *Epeira adiantoides* (Peru). 89. (Michoacan). 90. (California). Scales. 0.1 mm, abdomens 1 mm.







Map 6. Distribution of *Neoscona oaxacensis* (Keyserling).

in Sonora. *Colias* butterflies have been found in its web in California. Chamberlin (1920) reports the spider to be a nuisance because of the abundant webs at Saltair Beach Resort, Utah.

*Distribution.* California and Utah, Kansas south probably to Peru (Map 6) and Galapagos Islands. There are some collections from isolated localities: Providence, Rhode Island (N. Banks); Lafayette, Indiana, 16 August 1920; and Wawawai, Washington Territory (N. Banks). It probably is also found on Hawaii.

***Neoscona neotheis* (Petrunkevitch)**

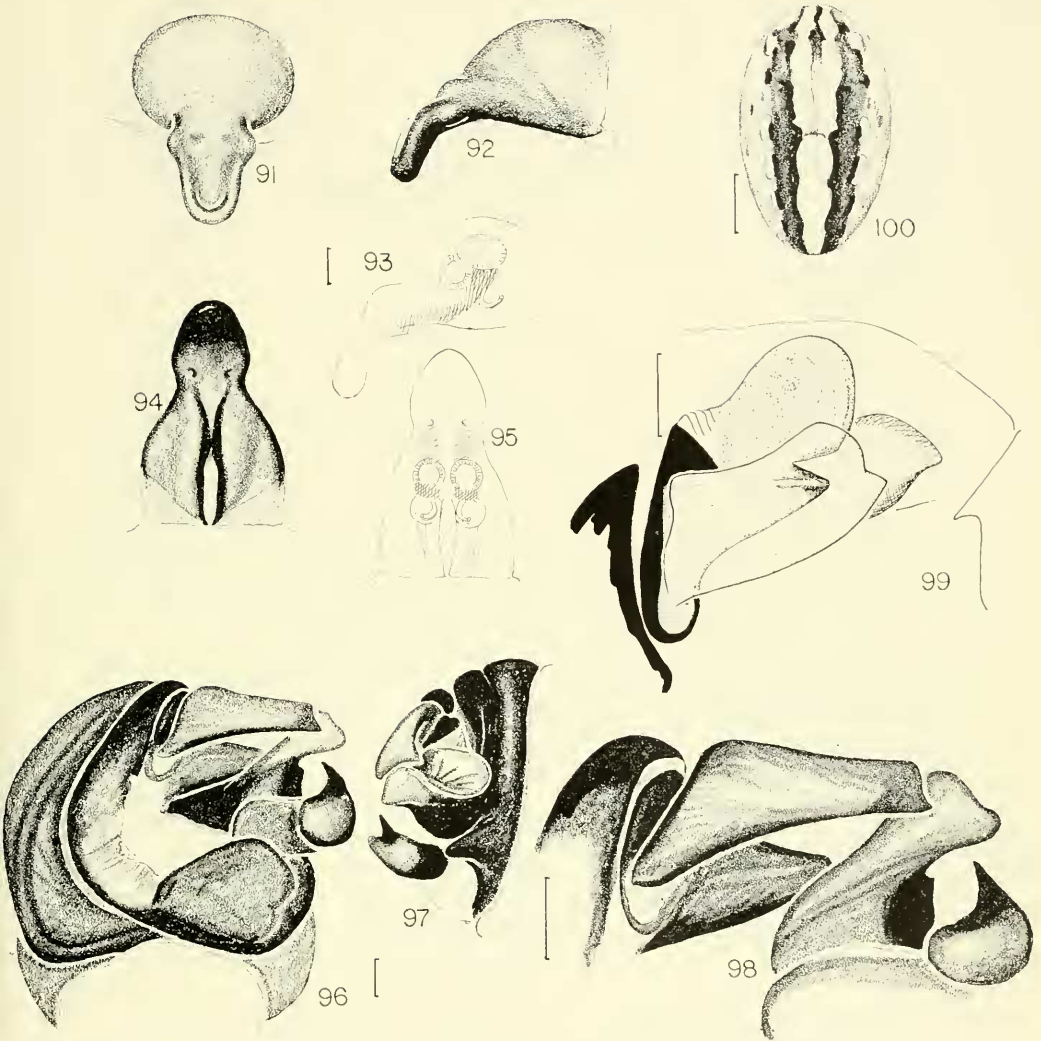
Figures 12, 91–100, 130, 131; Map 7

*Epeira theisii*. — Keyserling, 1893, *Spinnen Amerikas*, 4: 246, pl. 12, fig. 184, ♀, ♂. McCook, 1893, *American Spiders*, 3: 166, pl. 6, figs. 8, 9, ♀, ♂. Not *Epeira theis* Walckenaer.

*Araneus neotheis* Petrunkevitch, 1911, *Bull. American Mus. Natur. Hist.*, 29: 305. New name for *Epeira theisii*, Keyserling.

*Cubanella nidicola* Franganillo, 1926, *Cuba Contemporanea*, 41(161): 15, fig. 6, ♂. The Franganillo collection is in the Cuban Academy of Sciences, Havana, but the index to vial numbers is lost. NEW SYNONYMY.

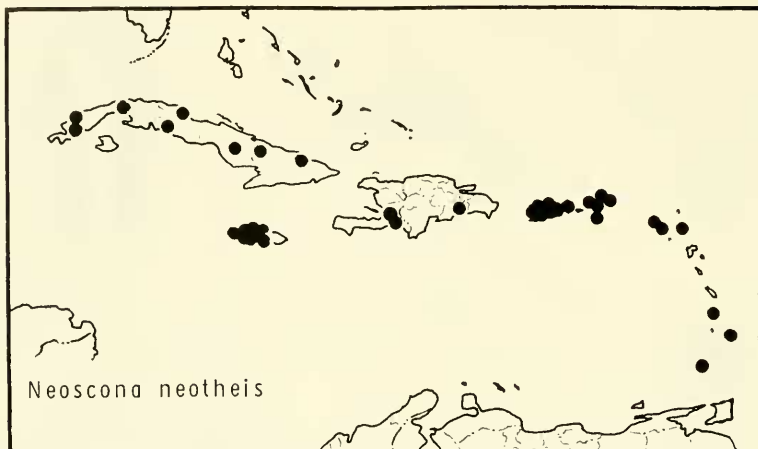
*Neoscona oaxacensis*. — Petrunkevitch, 1930,



*Neoscona neotheis* (Petrunkevitch). Figs. 91-95. Epigynum. 91. Ventral. 92. Lateral. 93. Lateral, cleared. 94. Posteriodorsal. 95. Posteriodorsal cleared. Figs. 96-99. Left palpus. 96. Ventral, cymbium removed. 97. Lateral. 98. Ventral view of palpal structures. 99. Apical view. Fig. 100. Female abdomen.  
Scales. 0.1 mm, abdomen 1 mm.

Trans. Connecticut Acad. Sci., 30: 322, figs. 200-204, ♀, ♂. Not *Neoscona oaxacensis* Keyserling.  
*Cubanelia recta* Franganillo, 1930, Mem. Inst. Nac. Habana, 1 (1): 66, fig. 8, ♂. 1936, Los Arácnidos de Cuba hasta 1936, p. 77, figs. 35, 36, ♂. Type not examined, see above. NEW SYNONYMY.  
? *Neoscona parallela* Franganillo, 1931, Rev.

Belén, 1: 44. Type not examined, see above.  
Franganillo, 1936, Los Arácnidos de Cuba hasta 1936, p. 78. *Nomen dubium*.  
*Neoscona nidicola*. — Franganillo, 1936, Los Arácnidos de Cuba hasta 1936, p. 76, fig. 34, juv. ♀.  
*Neoscona neotheis*. — Gertsch and Mulaik, 1936, American Mus. Novitates, 863: 21, pl. 31, ♂. Bonnet, 1958, Bibliographia Arancorum, 2: 3059.



Map 7. Distribution of *Neoscona neotheis* (Petrunkevitch).

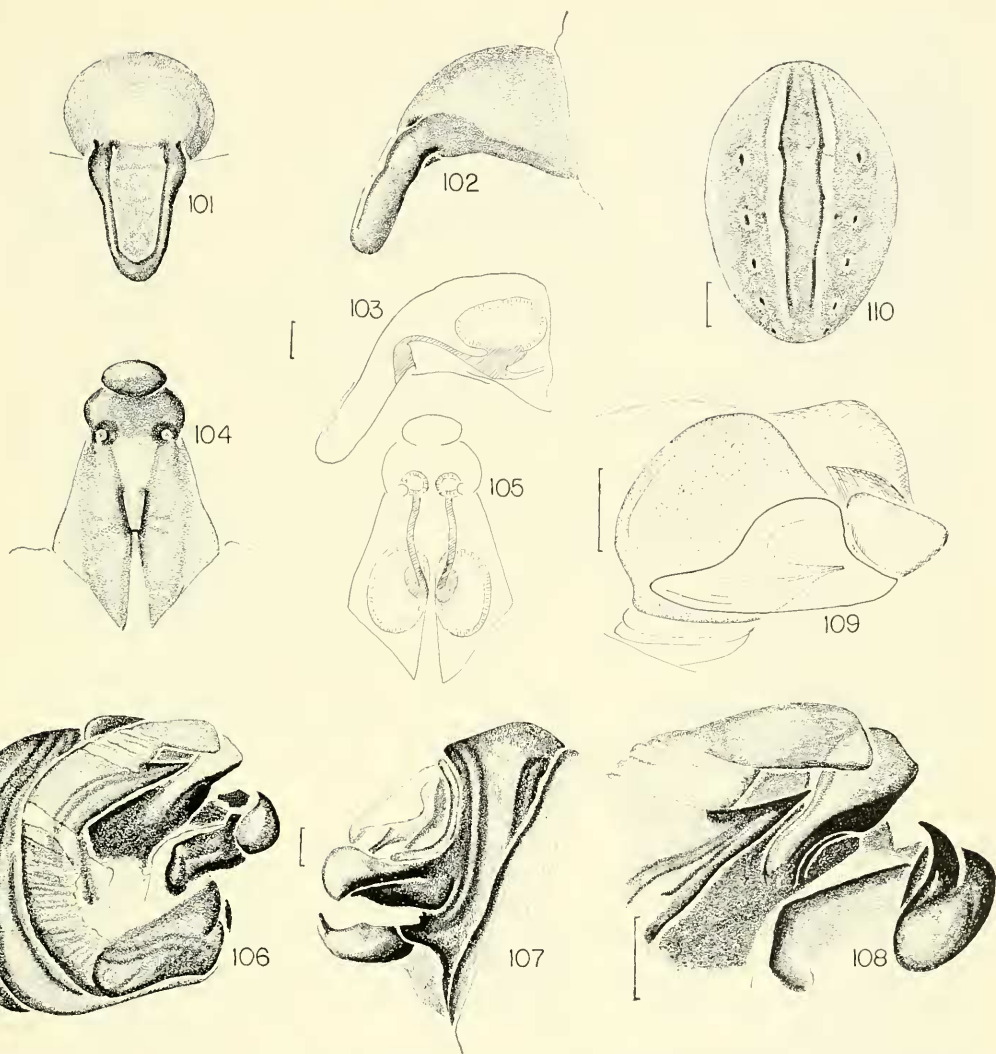
*Female.* Total length 5.7–17.0 mm. Carapace 2.2–6.3 mm long, 1.7–4.8 mm wide. A female from Puerto Rico, 6.5 mm total length. Carapace 2.4 mm long, 1.9 mm wide. First femur, 3.2 mm; patella and tibia, 3.7 mm; metatarsus, 2.9 mm; tarsus, 0.9 mm. Second patella and tibia, 3.2 mm; third, 1.8 mm; fourth, 3.1 mm.

*Male.* Total length 5.8–11.8 mm. Carapace 2.5–6.0 mm long, 2.3–5.4 mm wide. A male from Jamaica, 7.2 mm total length. Carapace 3.7 mm long, 2.9 mm wide. First femur, 4.5 mm; patella and tibia, 5.5 mm; metatarsus, 4.6 mm; tarsus, 1.3 mm. Second patella and tibia, 4.0 mm; third, 2.5 mm; fourth, 4.7 mm.

*Variation.* Some specimens, mostly from Cuba and Jamaica, are almost twice the size of others. At first it was thought these were hybrids. Small and large specimens are generally not found together. Certain collecting sites have large specimens, others small ones. Perhaps the larger size is due to the spider's undergoing more molts before maturity, possibly a result of competition with a similar sized species. Both large and small specimens show the diagnostic features of the species. The largest came from Camagüey, Cuba.

*Diagnosis.* Both sexes of this light colored species can be recognized by the dorsal

abdominal pattern, which consists of a median longitudinal white band with straight margins between two bold black longitudinal stripes (Fig. 100). The ventral abdominal pattern is less variable in this species than in most others and consists of two white bands on each side of the black central area with each band partly or completely constricted about a third of its length posteriorly from the epigastric furrow (Fig. 12). The scape of the female epigynum is not constricted near the midpoint, instead a single pair of lateral lobes is present between the midpoint and the apex, positioned so that each one arises proximally beneath the ventral surface and terminates distally by joining the margin of that surface (Fig. 91). The second tibia of the male is nearly straight with three rows of clasping macrosetae tapering to a single row of macrosetae near the proximal end (Figs. 130, 131). Unlike those of *N. oaxacensis*, the macrosetae of this species are triangular and not heavily curved. The macrosetae of a small male are illustrated by Figure 130, those of a large one by Figure 131. The male is separate from other species not only by markings but also by the unique sclerotized attachment of the terminal division of the palpus (Figs. 96, 98, 99).



*Neoscana pratensis* (Hentz). Figs. 101-105. Epigynum. 101. Ventral. 102. Lateral. 103. Lateral, cleared. 104. Posteriodorsal. 105. Posteriodorsal, cleared. Figs. 106-109. Left palpus. 106. Ventral, cymbium removed. 107. Lateral. 108. Ventral view of palpal structures. 109. Apical view. Fig. 110. Female abdomen.

Scales. 0.1 mm, abdomen 1 mm.

The pattern and spur on the fourth coxa of the male separate *N. neotheis* from all sympatric species. The genitalic characters separate it from the related *N. oaxacensis*, with which it has been confused. At times the pattern is like that of some Mexican *N. oaxacensis*.

*Natural history.* Specimens have been taken from a beach grove in Puerto Rico.

*Distribution.* West Indies (Map 7). One female from Costa Rica had an epigynum resembling that of *N. neotheis*. A male from Alto Parana, Taquararaza, Paraguay, had the radix-stipes hinge sclerotized and may be this species. It is possible that this is only a subspecies of *N. oaxacensis* connecting through intermediates in Venezuela. But no such specimens are known.

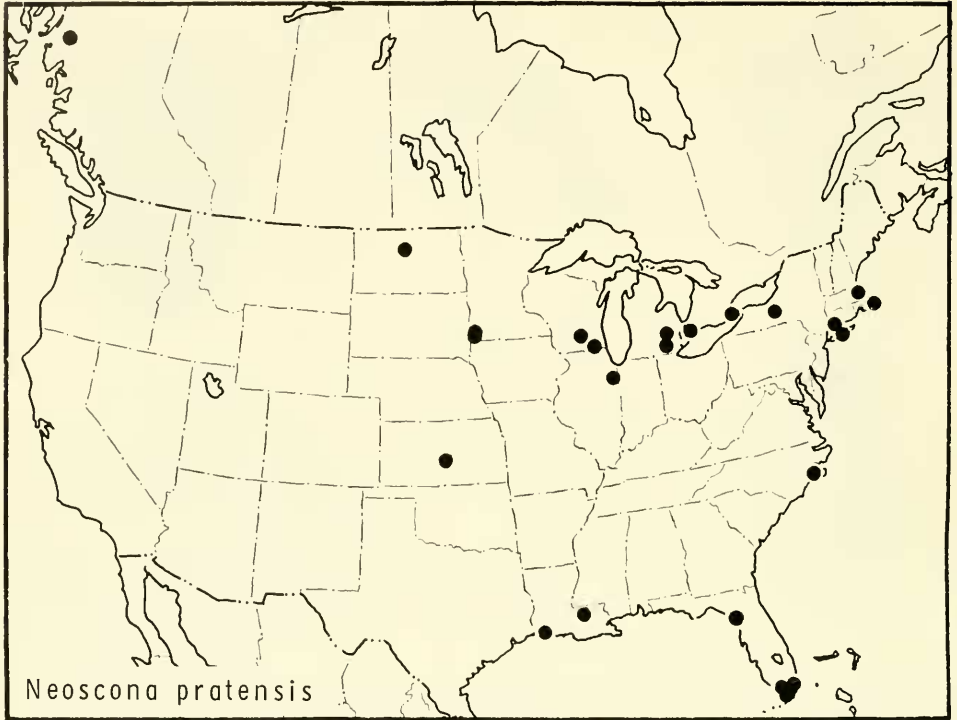
Map 8. Distribution of *Neoscona pratensis* (Hentz).*Neoscona pratensis* (Hentz)

Plate 1; Figures 101–110, 134; Map 8

*Epeira pratensis* Hentz, 1847, J. Boston Natur. Hist. Soc., 5: 475, pl. 31, fig. 11, ♀. Female type from Massachusetts, destroyed. Emerton, 1884, Trans. Connecticut Acad. Sci., 6: 310, pl. 33, fig. 15, pl. 36, fig. 9, ♀, ♂. Keyserling, 1892, Spinnen Amerikas, 4: 184, pl. 9, fig. 136, ♀. McCook, 1893, American Spiders, 3: 142, pl. 1, fig. 6, ♀, ♂. Emerton, 1902, Common Spiders, p. 167, fig. 396, ♀.

*Neoscona pratensis*, — Comstock, 1912, Spider Book, p. 502, fig. 537, ♀. 1940, Spider Book, rev. ed., p. 515, fig. 537, ♀. Kaston, 1947, Bull. Connecticut Natur. Hist. Surv., 70: 247, fig. 774, ♀.

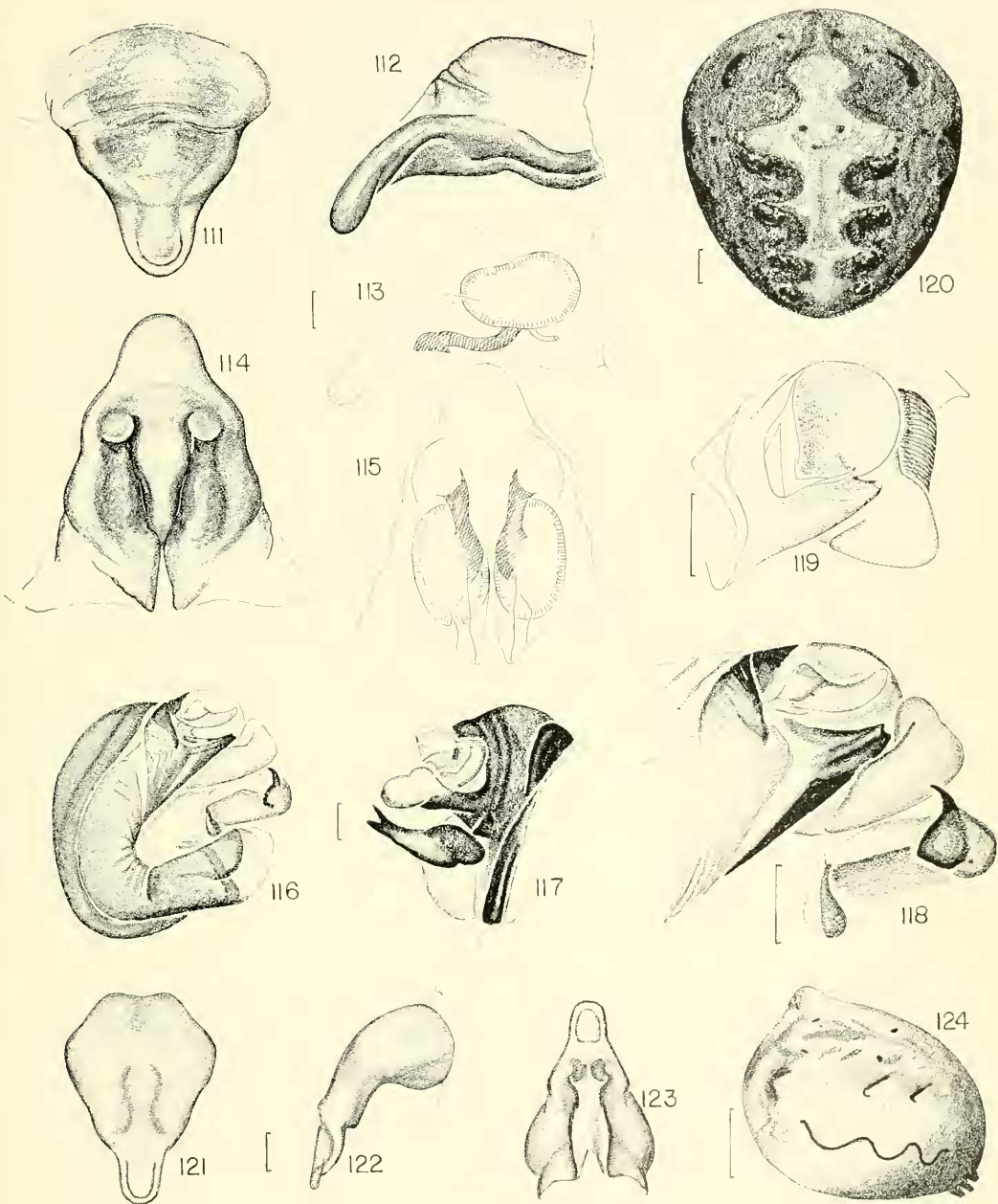
**Female.** Total length 6.5–10.2 mm. Carapace 2.9–4.4 mm long, 2.3–3.3 mm wide. A female from Long Island, New York, 9.5 mm total length. Carapace 3.6 mm long, 2.8 mm wide. First femur, 3.3 mm; patella and tibia, 4.3 mm; metatarsus, 3.0 mm;

tarsus, 1.0 mm. Second patella and tibia, 3.9 mm; third, 2.1 mm; fourth, 3.6 mm.

**Male.** Total length 6.7–7.9 mm. Carapace 3.4–4.1 mm long, 2.8–3.3 mm wide. A male from Long Island, New York, 7.0 mm total length. Carapace 3.7 mm long, 3.2 mm wide. First femur, 4.0 mm; patella and tibia, 5.2 mm; metatarsus, 3.9 mm; tarsus, 1.3 mm. Second patella and tibia, 4.3 mm; third, 2.7 mm; fourth, 4.3 mm.

**Variation.** There is considerable variation in size.

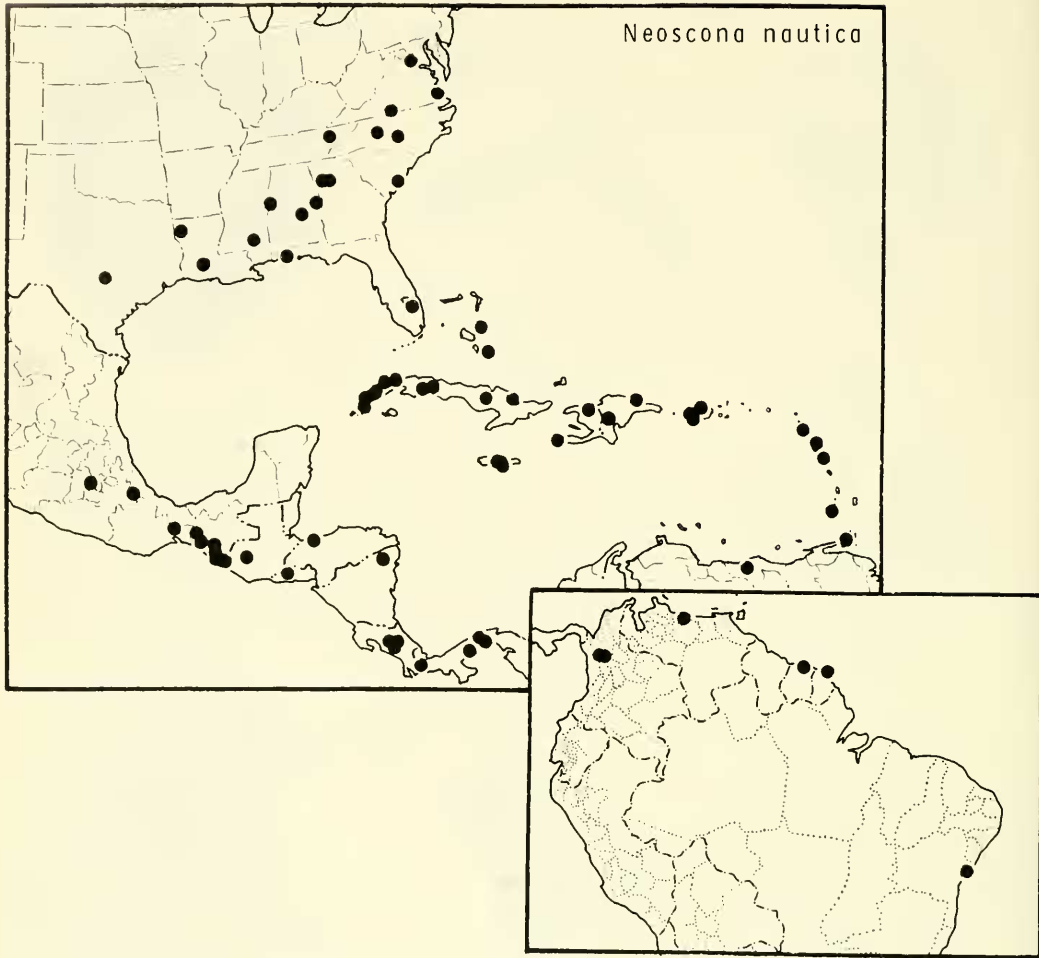
**Diagnosis.** Both sexes can easily be separated from related allopatric *N. neothis* and *N. oaxacensis* and sympatric *Neoscona* species by the dorsal abdominal pattern, which consists of a median, longitudinal dark band bordered by light colored longitudinal lines extending from the anterior end two-thirds to three-quarters of the way to the posterior end, and a



*Neoscona nautica* (L. Koch). Figs. 111-115. Epigynum. 111. Ventral. 112. Lateral. 113. Lateral, cleared. 114. Posteriodorsal. 115. Posteriodorsal, cleared. Figs. 116-119. Left palp. 116. Ventral, cymbium removed. 117. Lateral. 118. Ventral view of palpal structures. 119. Apical view. Fig. 120. Female abdomen.

*Neoscana redempta* (Gertsch and Mulaik). Figs. 121-123. Epigynum. 121. Ventral. 122. Lateral. 123. Posteriodorsal. Fig. 124. Female abdomen, dorsolateral.

Scales. 0.1 mm, abdomens 1 mm.

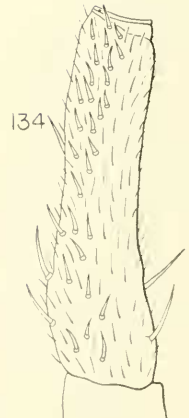
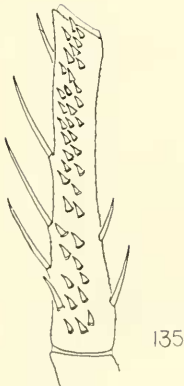
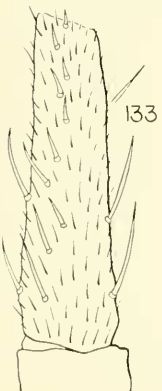
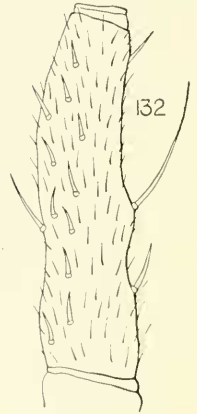
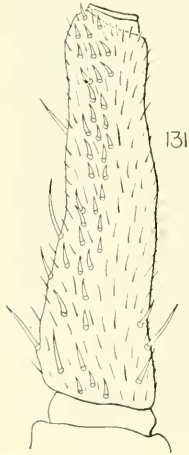
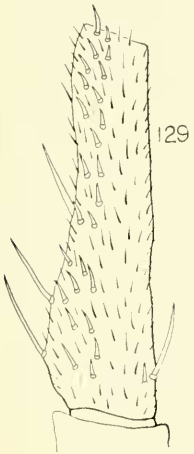
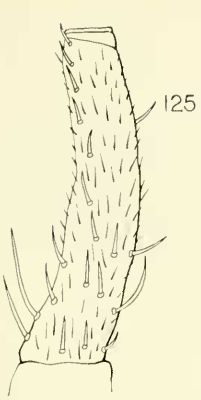


Map 9. Distribution of *Neoscona nautica* (L. Koch).

row of black spots to the side of each band, all on a solid, generally brownish to greenish background (Fig. 110). The scape has no lateral bulges and is not narrowed near the midpoint, but the margins of the ventral surface tend to be somewhat ragged along the proximal half of the scape (Fig. 101). The second tibia has three rows of clasping macrosetae (Fig. 134).

*Natural history.* The species has been collected from salt marshes in New England and on Long Island, on a bridge in Minnesota, and in pine-palmetto in Everglades National Park; from a salt marsh, Levy County, Florida, and by sweeping upland fields in the George Reserve, Michigan. It seems to have a preference for marshes and swamps. Specimens are





mature from May on in Florida, from August in Michigan.

*Distribution.* From Terrace, British Columbia, to New England, south to Florida (Map 8).

### *Neoscona nautica* (L. Koch)

Figures 13, 111–120, 132; Map 9

*Epeira vulgaris* Hentz, 1847, Proc. Boston Soc. Natur. Hist., 5: 469, pl. 30, fig. 6, ♀. Female holotype from South Carolina, destroyed. *Nomen dubium*. Not *Aranea vulgaris* Linnaeus, 1858 [= *Tegevaria domestica*]. The generic names *Aranea* and *Epeira* are objective synonyms.

*Epeira tristis* Taczanowski, 1873, Horae Soc. Entomol. Rossicae, 9: 131. Female holotype from Iles du Salut, French Guiana, in the Polish Academy of Sciences, Warsaw, examined. NEW SYNONYMY. Not *Epeira tristis* Blackwall, 1862.

*Epeira nautica* L. Koch, 1875, Aegyptische und Abyssinische Arachniden, p. 17, pl. 2, fig. 2, ♀. Female holotype from Suakin, [Sudan], in the British Museum, Natural History, examined.

*Epeira volucripes* Keyserling, 1885, Verhandl. Zool. Bot. Ges. Wien, 34: 528, pl. 13, fig. 27, ♀. Female syntypes from Panama and Haiti in the Museum of Comparative Zoology, examined. 1892, Spinnen Amerikas, 4: 199, pl. 9, fig. 147, ♀, ♂. McCook, 1893, American Spiders, 3: 162, pl. 6, figs. 1, 2, ♀, ♂.

*Neoscona volucripes*, — F. P. Cambridge, 1904, Biologia Centrali-Americana, Araneidea, 2: 473, pl. 44, fig. 18, ♀.

*Epeira tristimoniae* Petrunkevitch, 1911, Bull. American Mus. Natur. Hist., 29: 320. New name for *Epeira tristis* Taczanowski. NEW SYNONYMY.

*Neoscona nautica*, — Petrunkevitch, 1930, Trans. Connecticut Acad. Sci., 30: 321, figs. 197–199, ♀, ♂. Comstock, 1940, Spider Book, rev. ed., p. 513, fig. 536, ♀. Bonnet, 1958, Bibliographia Araneorum, 2: 3058.

*Neoscona vulgaris*, — Comstock, 1912, Spider Book, p. 500, fig. 536, ♀. Archer, 1940, Paper Alabama Mus. Natur. Hist. 14: 50. Bryant, 1945, Bull. Mus. Comp. Zool. 95: 380.

*Araneus marcuzzii* DiCaporiacco, 1955, Acta Biol. Venezuelica, 1(16): 355, fig. 35, ♀. Female holotype from Caripano, Sucre, Venezuela, in Museo di Biologia, Universidad Central de Caracas, examined. NEW SYNONYMY.

*Note.* This widespread species has been cited many times with the specific name

*nautica* (Bonnet, 1958). Archer (1940) designated a neotype for *Epeira vulgaris* Hentz and deposited it in the Alabama Natural History Museum. There were three specimens marked neotype that had dried. Archer's neotype meets only a few of the conditions of Article 75 of the International Code of Zoological Nomenclature. The specimens have been sent to the American Museum where other Archer specimens are kept.

*Female.* Total length 7.0–11.5 mm. Carapace 3.2–4.4 mm long, 2.6–3.5 mm wide. A female from Alabama, 8.0 mm total length. Carapace 2.9 mm long, 2.4 mm wide. First femur, 3.2 mm; patella and tibia, 4.3 mm; metatarsus, 3.2 mm; tarsus, 1.0 mm. Second patella and tibia, 3.5 mm; third, 2.2 mm; fourth, 3.6 mm.

*Male.* Total length 4.5–5.4 mm. Carapace 2.3–2.9 mm long, 2.0–2.3 mm wide. A male from Alabama, 4.7 mm total length. Carapace 2.3 mm long, 2.2 mm wide. First femur, 3.3 mm; patella and tibia, 3.9 mm; metatarsus, 2.9 mm; tarsus, 0.9 mm. Second patella and tibia, 2.8 mm; third, 1.8 mm; fourth, 2.9 mm.

*Variation.* There is little variation in color and shape. The bars on the abdomen are at times more distinct.

*Diagnosis.* The scape of the female is extremely broad and triangular (Fig. 111), unlike that of any other American species. The carapace is dark brown, the legs are dark brown, the dorsal abdomen is dark olive or brown with a characteristic pattern (Fig. 120). The sides are black with a distinct lobed edge toward the lighter dorsum, and the ventral abdomen has a fairly consistent pattern that resembles two music notes facing each other (Fig. 13). The black sides separate the species from *N. hentzii*. The male is lighter in color. The second tibia of the male has a strangely haphazard row of prolateral macrosetae and a large median ventral macroseta that is diagnostic (Fig. 132). The terminal apophysis of the palpus (Figs. 118, 119) is a small, narrow, bent structure,

very different from the flap present in all native American species.

*Natural history.* The species has been collected from cliffs in Puerto Rico, from a pigpen in Panama, a stable in North Carolina, buildings in Louisiana, and a market in Tennessee.

*Distribution.* Cosmotropical; Southeastern United States as far north as Virginia; Mexico, Central America, West Indies, and South America (Map 9). The species is also common in Hawaii and Guam, Mariana Islands. The fact that a cosmopolitan species is present in the Southeast but seems absent from California is of interest. Its closest relatives are found in the South Pacific area.

*Neoscona redempta* (Gertsch and Mulaik),  
New Combination

Figures 121–124

*Aranea redempta* Gertsch and Mulaik, 1936, American Mus. Novitates, 863: 18, fig. 39, ♀. Female holotype from Edinburg, Texas, in the American Museum of Natural History, examined.

*Description.* Female holotype. Carapace brown, dark on sides. Sternum with white pigment, dark around edge. The legs are banded. The abdomen has a gray folium

and a black wavy line on each side (Fig. 124). The venter has a pair of white spots side by side. The median eyes are on slight tubercles. Total length, 5.2 mm. Carapace 2.0 mm long, 2.1 mm wide. First femur, 2.1 mm; patella and tibia, 2.8 mm; metatarsus, 1.7 mm; tarsus, 0.5 mm. Second patella and tibia, 2.5 mm; third, 1.7 mm; fourth, 2.3 mm.

*Diagnosis.* The humped abdomen (Fig. 124) is unusual for *Neoscona* species. The epigynum (Figs. 121–123) is also unique.

*Records.* No specimens other than the type have been found.

## REFERENCES

- ARCHER, A. F. 1941. The Argiopidae or orb-weaving spiders of Alabama. Paper Alabama Mus. Natur. Hist. **14**: 7–77 (1940).
- BEATTY, J. A. 1970. The spider genus *Ariadna* in the Americas (Araneae, Dysderidae). Bull. Mus. Comp. Zool. **139**: 433–518.
- CAMBRIDGE, F. O. P.- 1904. Biologia Centrali-Americana, Arachnida-Araneidea, vol. 2.
- COMSTOCK, J. H. 1940. The Spider Book. Rev. ed. New York, Doubleday; and Ithaca, Cornell Univ. Press.
- KASTON, B. J. 1948. Spiders of Connecticut. Bull. Connecticut Geol. Natur. Hist. Surv. **70**: 1–874.
- MAYR, E. 1963. Animal Species and Evolution. Cambridge, Harvard University Press.
- MICHENER, C. D. 1970. Diverse approaches to systematics. Evol. Biol. **4**: 1–38.

## INDEX

Valid names are printed in italics. Page numbers refer to main references, starred page numbers to illustrations.

*adianta*, 472, 473

*adiantoides*, 486

*amulensis*, 484

*arabesca*, 468,° 471,° 474, 475,° 479,° 497°

*arkansa*, 480

*benjamina*, 477, 478, 480

*byzanthina*, 473

*Chinestela*, 469

*conifera*, 488

*cooksonii*, 486

*crucifera*, 473

*Cubanella*, 469

*domiciliorum*, 468,° 469,° 477, 479,° 497°

*domiciliorum*, 480

*Eriovixia*, 469

*eximia*, 485

*granadensis*, 473

*hentzii*, 478, 481,° 497°

*jonesi*, 485

*lativulva*, 488

*marcuzzii*, 498

*minima*, 476

*mutabilis*, 480

*naiba*, 476

*nautica*, 471,° 495,° 497,° 498

*nebraskensis*, 480

*Neoseona*, 469

*Neosconopsis*, 469

*neotheis*, 471,° 490, 491,° 497°

*nidicola*, 490

*oaxacensis*, 471,° 486, 489,° 497°

*orizabensis*, 471,° 484, 485,° 497°

*parallela*, 491

*pratensis*, 468,° 493,° 494, 497°

*punctigera*, 480

*recta*, 491

*redempta*, 495,° 499

*rubicunda*, 480

*sacra*, 480

*salaeria*, 488

*singularis*, 474

*theisii*, 490

*tristimoniae*, 498

*tristis*, 498

*trivittata*, 474

*utahana*, 485, 487,° 497°

*vertebrata*, 487

*volucripes*, 498

*vulgaris*, 498